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From 1 Mile to 2,530 Miles

TWENTY-FIVE years ago on October 30, 1909, Mr. (now Lieut. Col.) J. T. C. Moore-Brabazon won a *Daily Mail* prize of £1,000 for the first circular mile flown in Great Britain in a British aeroplane with a British engine. Twenty-five years ago that was a very great feat, as the amount of the prize money shows. Now we think little enough of a flight of 2,530 miles in record time from Mildenhall to Baghdad. It is not an endurance record, as Moore-Brabazon's mile was in 1909. It takes a flight of 11,300 miles to Melbourne in under three days really to stir our depths; and before these words appear in print who knows whether that record will not have been broken?

None the less, in these wonderful times when records are made every year, and are made only to be broken, it is salutary to cast our minds back a quarter of a century, which may seem ancient history to the modern pilot ("1066 and all that") but is really very fresh in the memories of the middle-aged, and to ponder over the slow, painful progress which was leading to—do we even yet know whither it was and is leading? If Moore-Brabazon's mile in 1909 was hailed as a great step forward, was not Hinkler's lone trip to Australia in sixteen days thought equally marvellous in 1928 (only six years ago); and now the bare idea of a regular air line taking a fortnight on that same journey arouses fiery and righteous indignation in all bosoms. A few years hence and it may well be that the bright young pilots of the day will hoot with derision at the old fogeys who got excited about the crawling progress of those tortoises, Scott and Campbell Black.

Meantime the high-speed record is constantly being pushed up higher and higher. We wish that Great Britain were engaged in the worthy task of pushing it, but as the authorities have ruled that that may not be, we give our unstinted admiration to our friendly rivals, the Italians, and offer our heartiest congratulations to their grand pilot, Lieut. Francesco Agello. We must have our national rivalries and international competitions, for they do good, and when conducted in the proper spirit they are very enjoyable. Aeronautical progress, however, is a matter for the world. Future ages will not be much concerned with the nationality of the pioneers who increased the speed and the range and the ceiling of aircraft, so long as the work has been well done. Everyone stands to profit by each step in advance. If Great Britain is not to engage for the time being on the work of pushing up the absolute speed of aircraft, let us be grateful that this desirable work is being well and truly done by others. Future travellers to Australia will probably have cause to thank the Italians, as well as the men who made and those who flew the "Comet," for the speed with which they will be able to get to the other side of the world.

The Reward

THERE are still not a few questioners who ask if all this speed is worth while. Does it, they ask, make life any happier? Is it worth the price paid in lives and in toil? Such doubters are probably thinking chiefly of the weekly butcher's bill on the roads of Great Britain. Probably the majority of the road deaths are not due to speed alone, but the reactionaries are able to say quite truly that if no motor car travelled at more than, say, 10 miles an hour there would be practically no road deaths. One cannot controvert that argument; but it applies also to railway accidents. If no train travelled at more than 10 m.p.h. there would be practically no fatal railway accidents. In the air, speed does not mean danger; though if high air speed means also high landing speed, then an element of danger is introduced.

The argument of the enemies of speed becomes more potent when they ask if the high *tempo* of modern life does not bring more wear and tear for the human frame. The point must be granted. Each invention of science which was intended to save time has brought

with it, not more leisure, but more expenditure of energy. To travel by train saved the long, and presumably wearisome, journey on horseback or by stage coach. Yet, because man can travel more easily, he now exhausts himself by travelling a great deal more. The invention of the telephone saved the slow writing of many letters or going in person to make the necessary communication. Yet the modern business man who uses the telephone returns home each evening far more fagged out than did his predecessor in the days when communications were slow.

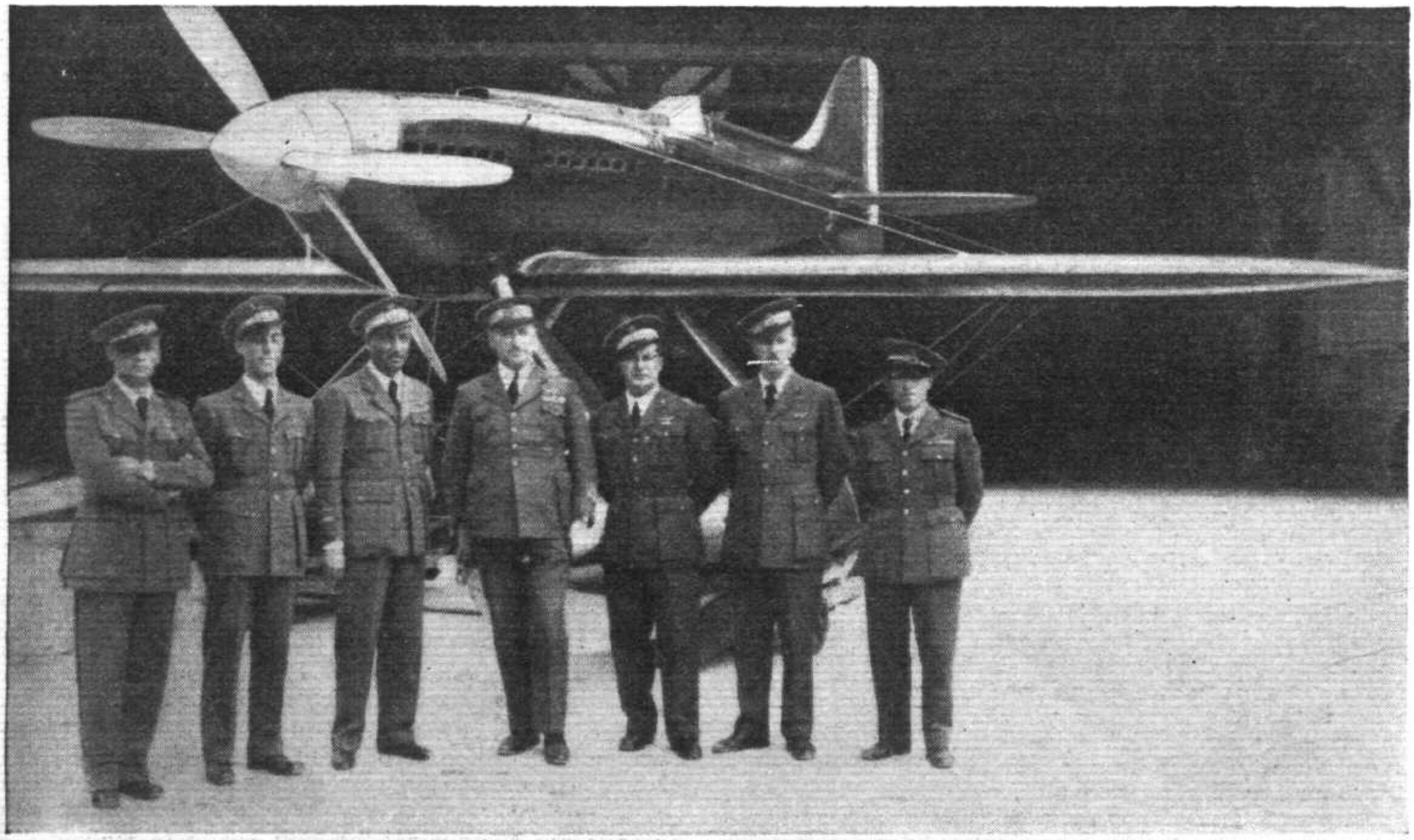
Strengthening the Bonds

TO say that mankind cannot stand still is a trite remark. Nevertheless, let us look for a moment on the other side of the picture. If the scientific inventions which have brought speed of communications have meant more weariness to the business man's flesh, yet they have brought a very great measure of happiness in their train. In the great Dominions of the British Empire the greatest curse has been loneliness. Farmers in the Prairie Provinces of Canada have found life made more tolerable by a daily conversation on the telephone with a relative or friend on the nearest farm many miles away. In the frozen North the aeroplane now brings comforts, mails, and medical aid to people who were previously isolated from all civilisation for many months of the year. To the plains of Northern Queensland and of West Australia the aeroplanes of Qantas and of W. A. Airways have been an unmitigated boon. In the past not a few settlers have given up their farms because they could not bear the loneliness and the impossibility of getting a doctor in cases of sudden illness or accident. The aeroplane is steadily and surely removing that curse from those great lands.

We must remember, too, that it is a need of the over-populated Mother Country that those great empty spaces shall be filled, and that new commerce shall grow up between the various countries of the British Empire. Everyone has known of cases where young men and women would have liked to go out to New Zealand or Australia but have shrunk from going so far out of touch with their parents. The aeroplane will soon cut the ground from under that argument. Australia will soon be nearer to London in time than Edinburgh was a century and a half ago. The cost of an air passage will for some time remain beyond the means of the very poor, but soon, we hope, there will be a cheap flat rate for Empire air mails, and soon a service twice or even three times a week. Letters will soon come frequently from the settler in Northern Queensland to his old parents in a Devonshire village, bringing news only three or four days old. The boy will not seem so far away then.

This may seem a trifling domestic matter, and it is Big Business rather than domestic amenities which is usually meant when the advantages of speed are discussed. But the sentimental and the psychological sides of life never lose their importance, however far science may progress. If men are happier in their minds when they sail for the Dominions, and happier in their minds when they have settled on a farm miles away from the nearest neighbours, the movement to take the landless man to the manless lands will receive a tremendous impetus. From such a development all the world stands to benefit.

The modern world must not fear the increase of speed. It must welcome it as one of the greatest boons. Speed may bring more labour, but it will assuredly also bring more happiness.



THE ITALIAN HIGH-SPEED FLIGHT: From left to right, Warrant-Officer Fruet, Lt. Buffra, Lt.-Col. Cassinelli, Col. Bernasconi, Commandant of the High-speed Flight, Capt. Baldi, Capt. Scapinelli, and Warrant Officer (now Lt.) Agello. An article on the flight will be found on page 1152.

The Outlook
A Running Commentary on Air Topics

The R.A.F. Areas

WHEN the Wessex Bombing Area ceased to exist some time ago, and the bomber squadrons were rearranged in two new Areas, the Western Area and the Central Area, from both of which titles the ominous word "Bombing" (so out of favour at Geneva) was carefully omitted, there was a general grouping of night bomber squadrons under the Western Area, and of day bomber squadrons under the Central Area. The grouping was not completely harmonious, because Andover was the H.Q. of the Western Area, and at that station there were two day bomber squadrons, No. 101 B.S. ("Sidestrand") and No. 12 B.S. ("Hart"). These two remained under the orders of the Western Area, although they were the only day bomber units in a night bomber organisation. It is now announced that No. 101 B.S. is to remove itself and its "Sidestrands" to Bicester, where it will come under the Central Area. Room will be made for it by transferring No. 33 B.S. from Bicester to Upper Heyford. Room is being made at Upper Heyford by moving No. 99 B.S., a night bomber squadron ("Heyford") from there to the new station of Mildenhall. Upper Heyford will thus become a homogeneous station of three "Hart" squadrons. The "Heyford" squadron leaves the Central Area for the Western Area, thus adding to the harmonious grouping of the day and night bomber squadrons. There are rumours, however, that Mildenhall, which is no more in the West than is Manston, will ultimately become the first station of a new Eastern Area.

New Names for R.A.F. Machines

THE Fairey night bomber, which has been adopted for use in the R.A.F., is to be known as the "Hendon," a name which was once given to a Handley Page aeroplane, but which has died out as the type ceased to be manufactured. It may be noted that both our latest fly-by-night types have names beginning with "H," as has the now obsolescent "Hinaidi." We hope that there is no suggestion that the bombs of the night bombers may be dropped with disastrous effect where they ought not to be dropped.

The new Blackburn torpedo-spotter-reconnaissance machine is to be known as "Shark." It is not at all a bad name. The fish of that name is not popular with bathers, but naturalists tell us that it is a most useful scavenger, which clears the seas of a lot of undesirable matter. We do not want undesirable matter in our seas, and if it should appear, the "Shark" will be an appropriate agent for dealing with it.

Sportsmen All

THE newspapers of two non-competing nations accused us of unsporting conduct in the Australia race. Their accusations were based on error and were unimportant. We British do not see eye to eye with all races regarding sportsmanship, and it is significant that we can give the American and Dutch competitors full marks in this matter.

Roscoe Turner put sportsmanship in a nutshell with his famous remark to Scott, "It sure was an honour to take the fumes from your exhaust."

Then the Dutch; not only the pilots and crew of the K.L.M. Douglas, but the whole nation have behaved like true sportsmen throughout.

At Mildenhall, just before the start, Van Brugge, the genial wireless operator, peeped from the cabin door with a wink and shouted to an English colleague, "I'll be bringing you some spicy yarns from Melbourne, George!" That was the last we heard from the Douglas, and it is so English—or so Dutch. No last-minute heroics, no "pour la patrie" stuff.

All along the line the Dutchmen met with the sportsmanship they appreciated so much, and it all culminated at Albury when they were temporarily out of luck. The local sportsmen there used the town lighting system to signal them and brought their motor cars to light up the racecourse, and thereafter spent the night digging the Dutch machine from the mud. Meanwhile the good ship "Suffolk," in defiance, no doubt, of Admiralty regulations, shone her searchlight on the skies to help them.

The True Spirit

WHEN Scott and Campbell Black landed in Melbourne the first floral tribute handed them was from the K.L.M., and the first thing Parmentier and Moll did after arriving was to dig the victors out of bed to congratulate them over a celebratory drink.

Enthusiasm in Holland was genuine when the British "Comet" came in first, and a poster was printed by the K.L.M. bearing the words "Bravo Scotty!"

During the height of the enthusiasm in the Hague, where crowds collected to hear news of the race, somebody called for two minutes silence when news came through of the accident to Gilman and Baines in Italy.

It is probably not treasonable to regard the act of Her Majesty the Queen of Holland as essentially sporting, for she made all four of the K.L.M. crew Knights of the Order of Orange-Nassau and made no distinction of rank at all.

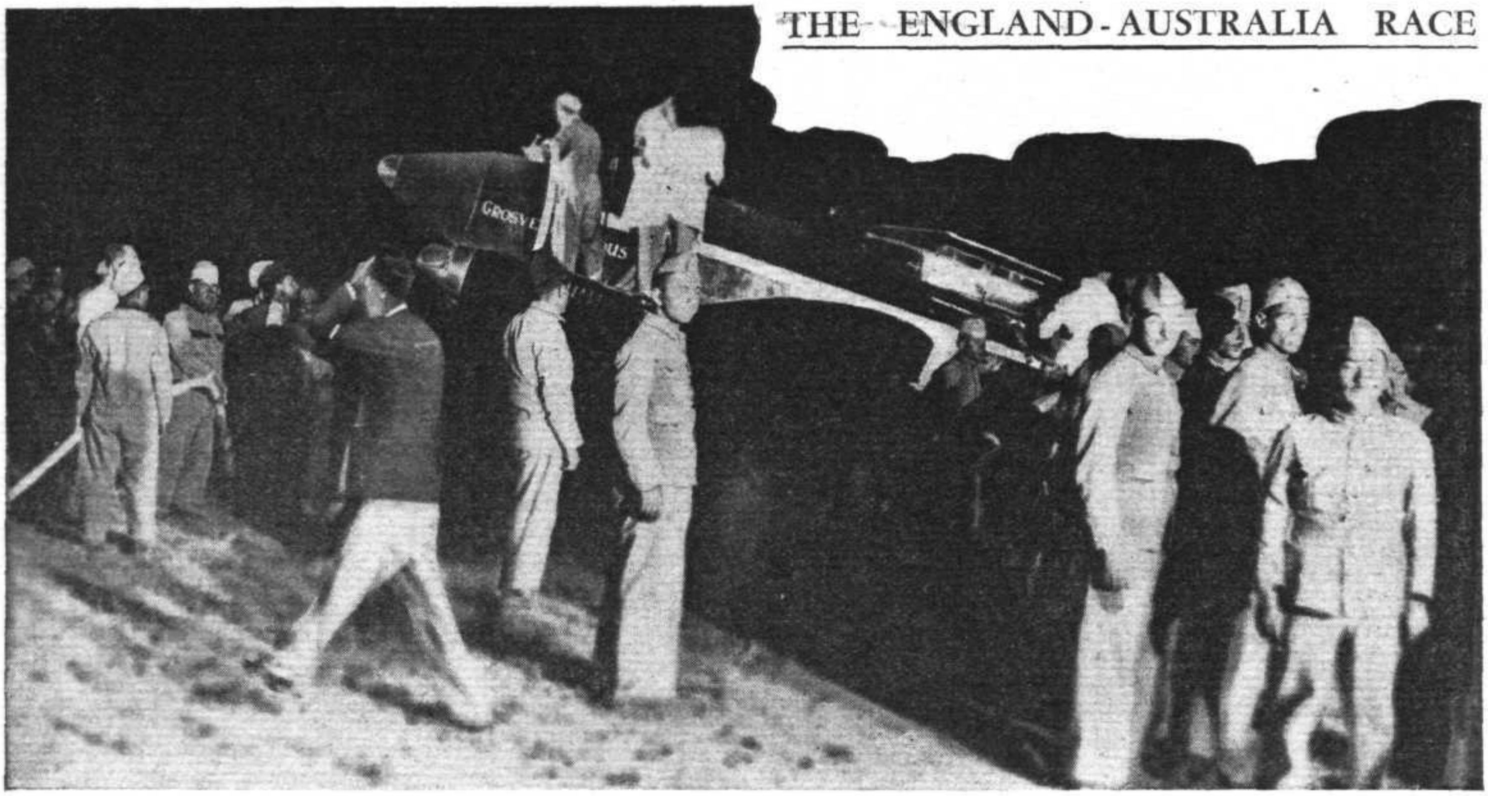
Lastly, a rumour has reached this country that the Royal Dutch Air Lines have presented whatever prize the Dutch entry has won to the Australian hospitals. If the race has taught us no other lesson, it has at least shown us that there are many good sportsmen in the aviation business.

The Irish Swoop(mi)stake

AFTER facing a very gentle barrage from an Italian paper and from Dr. Goebbel's special daily in Germany, the unsporting people in this country can be permitted a faint smile at the results of Col Fitzmaurice's final attempt. Had the Washington Department of Commerce allowed the Bellanca to start in the race, with its five hundred gallons of fuel, the machine would still have shed vital portions of its anatomy during the first few hundred miles of the journey to Baghdad. It was certainly better that the "shedding" should have taken place on a mere record attempt rather than in a race, when the crew might have made up their minds to carry on until forced to put down in some part of the world where the terrain was aeronautically uncivilised.

Everyone feels sorry for Col. Fitzmaurice, just as they did at the time of the fuel reduction, and he himself would be the last to impute any suggestion of favouritism to the decision of the Royal Aero Club Race Committee. He and his co-pilot, Mr. Bonar, who, incidentally, handled the Bellanca so well, have hoped for great things, and these great things may still come about.

The Bellanca appears to be an unusually interesting aeroplane that has been "spoilt for a ha'porth of tar," and there is still time for Rollason's to make any modifications—though every week of delay makes the flight to Australia more difficult.



NOCTURNE: Refuelling the winners' D.H. "Comet" at the Baghdad control. Scott and Campbell Black arrived almost immediately after the Mollisons had left for Karachi.

AFTER THE WINNERS

Lt. Cathcart Jones and Ken Waller, in a D.H. "Comet," reach Melbourne 4 days, 22 hours and 29 minutes after leaving Mildenhall, and obtain Fourth Place in the Speed Race. How the Competitors in the Handicap Race are faring

WHILE the victors were being fêted in Melbourne, the less startling but no less remarkable work by the other competitors in the speed and handicap races had been temporarily forgotten. Cathcart Jones and Ken Waller, with the second D.H. "Comet," were pressing on towards Batavia; the amazing "Hawk Major," flown by McGregor and Walker, had reached Calcutta, and had, incidentally, made better time between England and India than any other machine of its class; Hewett and Kay were reported at Allahabad with their "Dragon Six"; and the Stodart cousins, Hansen and Melrose, had all reached or passed Karachi.

The Dutchmen's second place had, it turned out, been more perilously obtained than was realised. Not only were Parmentier and Moll worried by the small size of Albury racecourse, but the big Douglas had sunk two feet into the mud, and the crew parted with their chances in the handicap race by jettisoning their pay load and internal equipment before flying out and on to Melbourne, which they reached at 12.54 a.m. (G.M.T.)—71 hours 28 minutes after leaving Mildenhall, at an average travelling speed of 137 m.p.h., and an average cruising speed of 173 m.p.h.

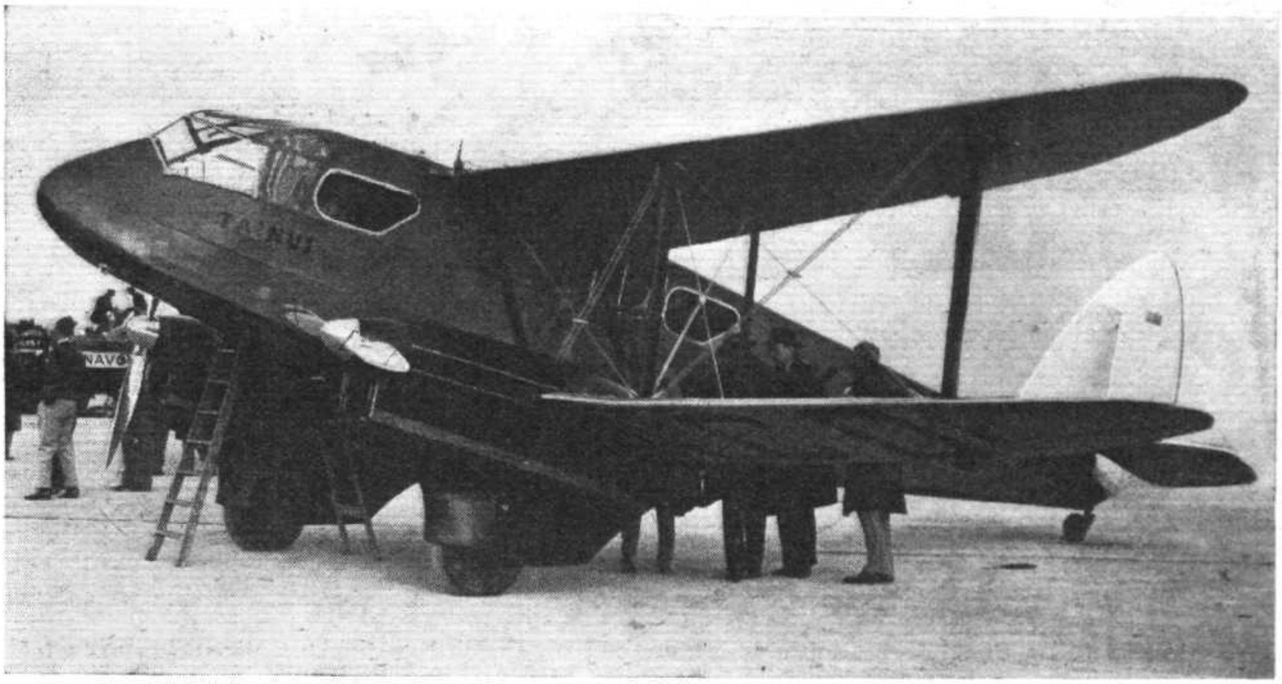
Eight hours after the winning D.H. "Comet" had crossed the line, the Douglas was flying in a thunderstorm, and wireless communication was seriously hampered. With a bare hour's supply of fuel Parmentier decided to take no risks, and landed at Albury with the assistance of light provided by motor car head lamps.

The performance of the Douglas is all the more interesting because K.L.M.'s originally intended to enter two machines in the race. *Niver (Stork)*, as the D.C.2 is called, was to have been equipped with extra fuel tanks, so that it could make non-stop flights between the controls, while the Fokker F.36, with twelve passengers on board, was to have competed in the handicap race. But the Fokker was not ready in time, and the Douglas was left with three passengers, 420 lb. of mail, and a fuel supply which was not great enough for "hops" longer than a thousand miles. The arrangement was a compromise, but, had it not been for the entry of the British "Comet," this machine might have been first in both events.

Col. Roscoe Turner's last day's flight was one of trouble. After leaving Darwin he and Pangborn went off their course, had trouble, and were late at Charleville. A broken oil pipe caused them to put the Boeing down at Bourke, 512 miles from Melbourne, and they eventually reached Melbourne, third in the speed race—3 days 21 hours out from Mildenhall. In spite of a reduced fuel supply, Turner had been making longer "hops" than the K.L.M. Douglas, but his cruising speed was lower, and the Boeing had fallen back slowly throughout the journey. Nevertheless, it was a magnificent effort.

A Chapter of Incidents

The unlucky Shaw, who had forced-landed on the first day in North Spain, had damaged his undercarriage while landing at Bushire; Johnny Wright, with the Lambert Monocoupé, had left Baghdad, and made a forced landing in South Persia, and had been arrested and released; F/O C. G. Davies and Lt Com. C. L. Hill were still delayed with control trouble at Nicosia, Cyprus; and Brook, with the Miles "Falcon," was awaiting a new propeller at Tatio aerodrome, Athens. Capt. Stack was,



A STANDARD RACER: The New Zealand D.H. "Dragon Six," *Tainui*, flown by J. D. Hewett and C. E. Kay, which, after running sixth in the speed race, was held up with minor damage at Cloncurry.

after all, bringing the "Viceroy" back to England, and the Mollisons were still delayed at Allahabad, and uncertain of their plans. Their non-stop flight to Baghdad, at an average of more than 200 m.p.h., had deserved a much better sequel.

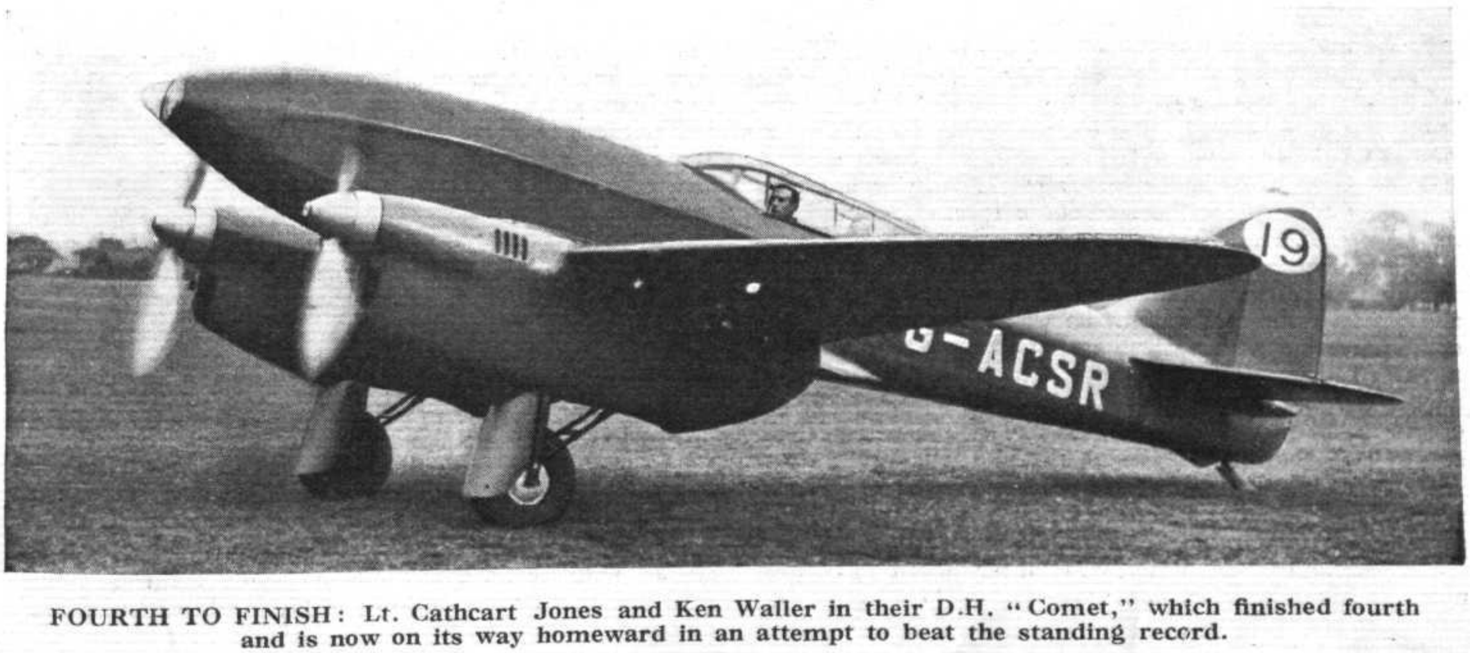
The second "Comet" arrived at Darwin at 3.13 a.m. (G.M.T.). Cathcart Jones and Waller left again an hour and a half later for Charleville, but were forced down at Mount Isa, mistaking it, perhaps, for Cloncurry, by lubrication trouble, and spent the night there, reaching Charleville at 10.50 p.m. (G.M.T.). Needless to say, Mount Isa is not a recognised checking point in the handicap event, so their time on the ground will, unfortunately, count as flying time. Incidentally, the limit machine, Hansen's Desoutter, which had left Calcutta, has a time allowance of more than forty hours over and above the time taken by the winning "Comet" for handicap purposes, so the possible results of the second event can only be guessed until every man is home or has reached his sixteen days' allowance.

McGregor and Walker had left Batavia for Rambang; Hewett and Kay were near Bangkok; the Stodarts had left Calcutta; and Melrose was at Allahabad.

Leaving Charleville again at 8.15 p.m. (G.M.T.), Cathcart Jones and Waller crossed the line at 4.59 a.m. (G.M.T.), and landed at Laverton aerodrome, where they were met by the merest handful of people. They had taken 4 days 22 hours 29 minutes from England, and were, it appears, helped by the authorities at Mount Isa in much the same way as the crew of the Douglas were helped at Albury. The "Comet" left on the return flight the following day, and the story of this flight appears elsewhere.

McGregor and Walker, with the "Hawk Major," were now on their way from Darwin, which they had reached in a time which easily eclipsed the old record, to Newcastle Waters; Hewett and Kay had left Batavia; the Airspeed "Courier" had left Singapore; Hansen was, unfortunately, held up with magneto trouble at Alor Star; Melrose had left Rangoon; and the Monocoupé had arrived at Jask after coping with the Persian authorities.

Meanwhile, the unlucky *Panderjager,* which was damaged at Allahabad when running third in the race, had been repaired and was due to leave. While taxying it collided with a car carrying lighting equipment, and was destroyed by fire. Asjes and Geysendoffer escaped before the machine caught alight. A handicap of the Pander S.4



FOURTH TO FINISH: Lt. Cathcart Jones and Ken Waller in their D.H. "Comet," which finished fourth and is now on its way homeward in an attempt to beat the standing record.

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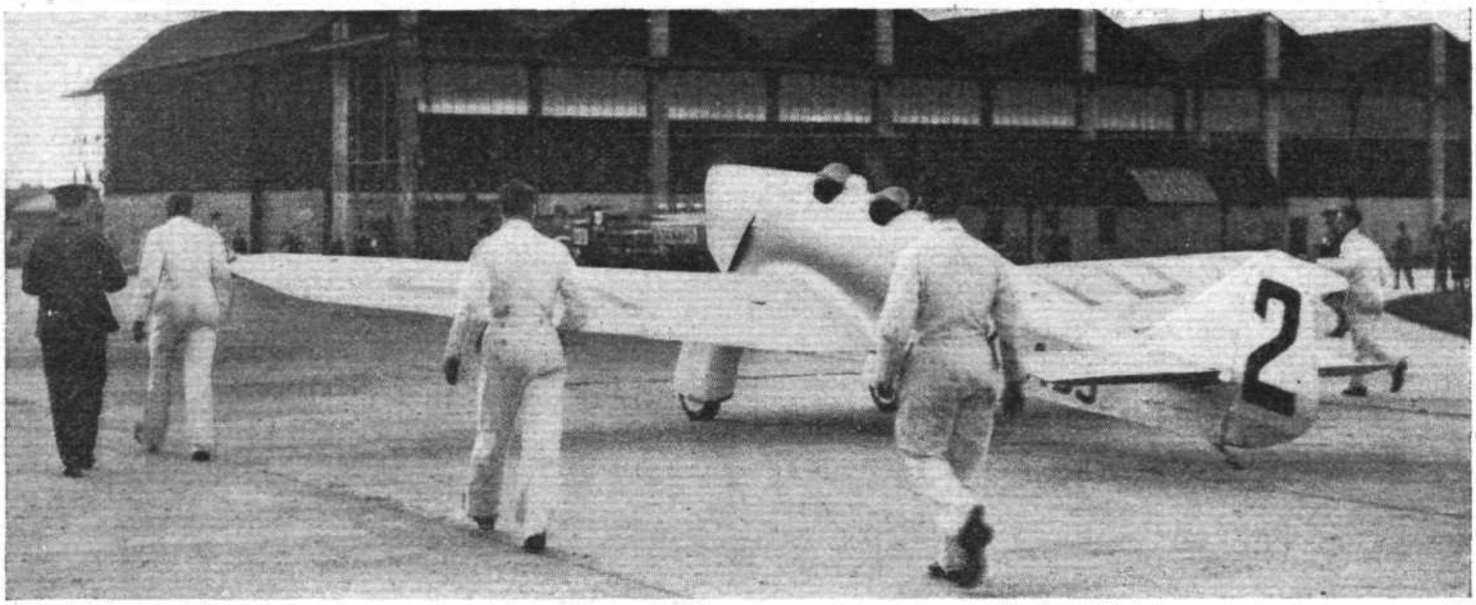


"HAWK MAXIMUS": Sqd. Ldr. Malcolm McGregor and Henry Walker reached Melbourne in their standard Miles "Hawk Major" 7 days 15 hours after leaving Mildenhall.

was the relatively poor view obtainable by the pilot when the tail was down, and the steep slope of the screen would undoubtedly cause disturbing reflections.

The Miles "Hawk Major" arrived at Melbourne on Saturday evening (English time) after a wonderful and apparently trouble-free flight from Mildenhall in a little over a week. McGregor's and Walker's actual flying time has still to be discovered from an examination, but their full time for the flight works out at something like 70 m.p.h., and is five days less than that scheduled for the Croydon-Brisbane mail service to be inaugurated in December. This on a light aeroplane which can be bought for much less than £1,000. One of the finer performances in the race, and McGregor should have comfortably beaten his handicap speed, which is 120.57 m.p.h.

On Sunday, the "Dragon Six" had reached Cloncurry and the Airspeed "Courier" was at Newcastle Waters. Melrose had had a bad time on the Timor Sea section, for he arrived at Darwin at 8 p.m. (G.M.T.), four and a half hours overdue, and with the merest smell of petrol in his tanks. A strong wind had blown him off his course, he had made a landfall some seventy-five miles south-west of Darwin, and had proceeded in the wrong direction. He left again at 5.56 p.m. (G.M.T.).

Hansen's Desoutter was at Batavia, but Wright and Polando were at Calcutta with engine trouble again—probably the fuel feed bother they had suffered at intervals.

Unfortunately, at Cloncurry Hewett and Kay taxied their "Dragon Six" into a fence, so that it seemed now as if they might even be beaten into sixth place. Luckily they are at a checking point, so, provided that the machine can be repaired, their handicap chances will not be impaired. But it is astoundingly bad luck.

The Stodarts reached Darwin on Sunday and left again for Camooweall, where they stayed the night. At Charleville, where they arrived at 8.10 a.m. (G.M.T.), they were leading the remaining competitors, and reached Melbourne at 12.55 a.m. (G.M.T.). So the "Courier" was sixth in the speed race after all.

KINGSFORD-SMITH AT HONOLULU

A 3,000-mile flight across the Pacific from Fiji in his England-Australia Lockheed "Altair"

IN the midst of the excitement of the England-Australia race, Sir Charles Kingsford-Smith's flight across the Pacific has hardly received due attention. Last week it was noted that he and his navigator, P. G. Taylor, had left Brisbane and arrived at Suva, Fiji, after a 1,520-mile non-stop flight in the Lockheed "Altair" which was originally entered for the Melbourne race. There he was held up by bad weather.

On October 28 he left Suva and flew the 3,197 miles to Wheeler Field, Honolulu, in 25 hours 5 minutes. During the whole of this long flight he was in constant wireless communication with various stations, but passed through a violent tropical storm which he was unable to climb over. According to one report, he accidentally knocked on the electrically-operated wing flap switch while in the storm, and the "Altair" stalled and spun.

However, the journey, which was covered at an average speed of 128 m.p.h., conclusively proved the unusual range of the "Altair."

This machine, incidentally, was not new when Sir Charles purchased it after selling his share in the "Codock," and was a converted "Sirius" with a Pratt and Whitney "Wasp" engine. The "Altair" is virtually a two-seater, long-range version of the commercial "Orion." For the Melbourne race the machine was named *Anzac*, but this has been changed to *Miss Southern Cross*, and it is now being returned to America to be sold.

Italian Tribute to British Pilots

On the morning of October 26 a funeral service for F/O H. D. Gilman and Mr. J. K. C. Baines, the New Zealand airmen who were killed while competing in the Australia Race, was held in the English Church at San Pasquale.

The two coffins, shrouded in British and Italian flags, were carried on the shoulders of officers of the Italian Air Force from the church, and were interred at the British cemetery.

Representatives of the Royal Aero Club of Italy, of the High Commissioner of Naples, and of the Italian forces, and members of the British colony, including the British Air Attaché in Rome, were present at the ceremony.

HOMEWARD BOUND

Cathcart Jones and Waller make Good Progress on their High-speed Return Journey with the Second "Comet"

On the morning after their arrival at Melbourne, Lt. Cathcart Jones and Ken Waller left in their D.H. "Comet" for England. They are making an attempt to beat the Australia to England record, and also to make a new record for the double journey. Their route will depend on the weather conditions, but will approximate to that taken by the competitors on their way out.

The attempt indicates considerable confidence in both machine and engines, and, if their return time equals their outward time, they will be back in this country only ten days after the machine took off from Mildenhall, and it is likely to be some time before such a record is broken.

Engine Failures Explained

Actually the troubles with the engines of the three "Comets" can reasonably be put down to a delicate mixture control—tests had not, after all, been completed before the start. The method used at the operating height —10,000 feet—was to move the mixture control lever until the revolutions commenced to drop and then to set it in a position where these were just held. Naturally, for reasons of economy, the pilots did not wish the mixtures to be, in the least degree, rich, and they possibly erred the other way—with unpleasant consequences. Automatic devices will probably relieve pilots of the work of mixture setting in the future.

The winners' oil pressure trouble may be attributed to a faulty gauge, for over the last section Scott opened up both engines and neither of them showed any tendency to dry up over 700 miles. During the major part of the Australian section the engine which showed no pressure was throttled right back for use when it was really necessary.

In any case, the "Comets" proved their ability to travel really long distances at high speed. Allowing for a deviation from their course, the flight of the Mollisons to Baghdad proved that their machine had a range of more than 3,000 miles at a 200 m.p.h. average.

The Cathcart Jones' "Comet" left Laverton at 9.50 p.m. (G.M.T.), reached Charleville in three and a half hours, and left again within the hour for Darwin, where it arrived at 8.45 p.m. (G.M.T.). They were carrying news films.

Their flight to Singapore from Darwin certainly suggests that the machine and engines are performing perfectly now after a mildly troublesome outward trip. They averaged a little over 200 m.p.h. for the "leg," covering 2,084 miles in 10 hours 40 minutes, and arriving at 7.40 p.m. (G.M.T.). This first section, at any rate, has been flown faster than by the winners in the reverse direction, but Cathcart Jones and Waller are, very sensibly, flying only by day.

There was some delay at Singapore, but the "Comet" eventually left soon after 11 p.m. (G.M.T.) and reached Allahabad at 9.55 a.m. (G.M.T.), where they stayed the night. Treating their route as a "straight line," the "Comet" had again averaged well over 200 miles an hour, and left for Karachi at 7.15 a.m. (G.M.T.)—two o'clock on Tuesday afternoon by local time.

THE "IRISH SWOOP" STARTS AT LAST—AND RETURNS

Trouble over Belgium with Bellanca Special

After all their many troubles Col. Fitzmaurice and Mr. E. W. Bonar left Lympne with the long-range Bellanca monoplane, *Irish Swoop*, on Monday at 7.14 a.m. in an attempt to beat the week-old Australia record.

Withdrawn after its fuel load had been cut down at Mildenhall, the Bellanca was taken first to Croydon, where tests were not permitted, and finally to Portsmouth, where the full load landing test was successfully carried out under the official eye. Thereafter, trouble was experienced with the lubrication system and the expected departure was delayed day by day.

However, it is now carrying fuel for a range of more than 3,000 miles at a cruising speed of 230 m.p.h. and has its international certificate. The machine took off at Lympne after an estimated run of less than 300 yards.

But all was far from well. Although the *Irish Swoop* appeared to be cruising comfortably at 11,000 feet, things started to happen near Liège. The engine cowling—which *did* appear to be flimsy to the casual observer—and the wheel covers buckled, and the wing fillets started to come adrift.

They returned to Lympne, dumped some of their petrol, and landed again soon after 10 o'clock. The machine was flown to Croydon for repairs.

Congratulations

Her Majesty the Queen sent the following message to C. W. A. Scott and T. Campbell Black:

"I warmly congratulate you both on your wonderful feat. We are very glad we saw you at Mildenhall before you set out on your great adventure, and trust that you are not unduly tired after the strain of the past three days."

The Duke of Gloucester telegraphed:

"Warmest congratulations on your wonderful achievement in a British machine."

Her Majesty the Queen of Holland has bestowed the Order of the Knight of the Orange Nassau on each of the four members of the crew of the Douglas.

Among hundreds of messages, cables of congratulation were sent to the winners by the Prime Minister, Lord Londonderry, Mr. J. H. Thomas, and Imperial Airways—who, incidentally, sent another telegram to Mr. Plesman of the K.L.M.

THE FOUR WINDS

ITEMS OF INTEREST FROM ALL QUARTERS

An Australian Flight Mishap

Mr. S. P. Jackson, who left Croydon on October 18 in his Avro "Avian" ("Hermes II") with the object of beating Sir Charles Kingsford-Smith's England-Australia record crashed in Italy last week, but was unhurt.

Natural Flight Exhibition

Some interesting exhibits relating to natural flight have been added to the National Aeronautical Collection at the Science Museum, South Kensington. Bird flight is represented by specimens of the Albatross and the Gannet, while flight by mammals is illustrated by a specimen of the fox-bat, and by fishes with the flying-fish and flying-gurnand. Specimens of Nature's gliders are shown by the flying-frog and flying-lizard. This section is dealt with from the standpoint of aerodynamics.

VICTORY! To celebrate the winning of the England-Australia air race by Scott and Black in the D.H. "Comet," De Havilland Aircraft Co. gave the staff at Stag Lane a half-holiday last week. Here are the "Comet" makers leaving the works.

Twenty-five Years Ago

From Flight of October 30, 1909.

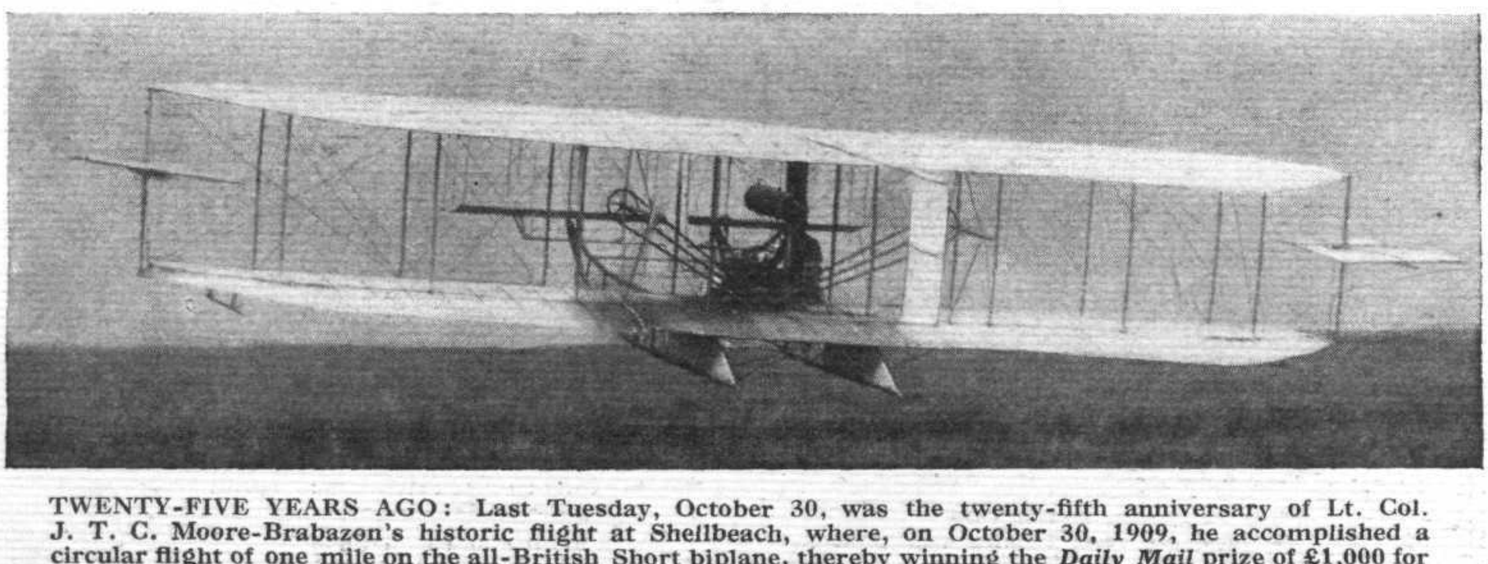
"Yet another sphere which some had thought man would, for some time, at any rate, retain for his own has been invaded by the gentle sex. Baroness La Roche has been successfully piloting a Voisin biplane, and has thereby earned the right to be known as the first lady flier or "aviatress." For some time the Baroness has been taking lessons from M. Chitem, the Voisin instructor, at Chalons, and on Friday of last week she was able to take the wheel for the first time. This initial voyage into the air was only a very short one, and *terra firma* was regained after 300 yards; but on the following day the parade ground at Chalons was encircled twice, the turnings being made with consummate ease."

Iraqi Aircraft in Turkey

Four aeroplanes have flown from Iraq to Angora to take part in the celebrations of the tenth anniversary of the Turkish Republic.

New President of the R.Ae.S.

At the first meeting of the 1934-35 session of the Royal Aeronautical Society, Mr. C. R. Fairey, the retiring President, took the chair at the opening. In introducing the new President, Lt. Col. J. T. C. Moore-Brabazon, Mr. Fairey said he thought they should place on record the fact that the R.Ae.S. had elected as its new President the first Englishman to fly. Lt. Col. Moore-Brabazon said it was a peculiarity of the Royal Aeronautical Society that the older it became, the more vigorous it became. Unhappily, human nature did not show the same trait. He recalled that the R.Ae.S. had reached its high-water mark during Mr. Fairey's period of office. In a fortnight [*i.e.*, last Tuesday] he would be celebrating the 25th anniversary of his winning the *Daily Mail* Prize.



TWENTY-FIVE YEARS AGO: Last Tuesday, October 30, was the twenty-fifth anniversary of Lt. Col. J. T. C. Moore-Brabazon's historic flight at Shellbeach, where, on October 30, 1909, he accomplished a circular flight of one mile on the all-British Short biplane, thereby winning the *Daily Mail* prize of £1,000 for the first Briton to fly a circuit of one mile in a British-made machine. Our illustration shows the actual flight in progress. (*Flight* Photo.)

A POLISH TWO-SEATER: The rear gunner in this P.W.S.19 observation monoplane has an exceptionally good field of fire rearwards.

A Flight to Kenya

Brigadier-General A. C. Lewin, who, as reported in last week's issue of *Flight*, is leaving England for his estate in Kenya this month in a Miles "Hawk Major," tells us that he was not accompanied by an instructor on his first flight out to Kenya, but by a friend, who navigated for him as far as Naples. On his last flight to Kenya his wife acted as pilot practically throughout the whole trip—an experience, he adds, he looks forward to being repeated on this next journey! Brigadier-General Lewin considers that those who wish to improve their flying, and at the same time have a most enjoyable and easy flight, cannot do better than make a trip to Kenya.

England-Australia Flights

Compiling a list of long-distance flights, such as those between England and Australia since 1919, published in *Flight* of October 11 last, is not an easy task, as information regarding some of the "hops-by-easy-stages" class of flights was in many cases unobtainable. We are, therefore, indebted to Mr. Kenneth Shenstone for some details of Mr. G. P. Fairbairn's flight in 1931. This was not a solo flight, as Mr. Shenstone accompanied him as passenger and co-pilot. They left Hanworth in a Spartan "Arrow" ("Gipsy II") on February 19, and after reaching Nice on February 20, no further news of their progress was received. Nevertheless, they did continue, and except for a forced landing (without accident) at Chittagong, they accomplished a more or less uneventful journey to Darwin, where they arrived on April 18.

Chinese General's Tour

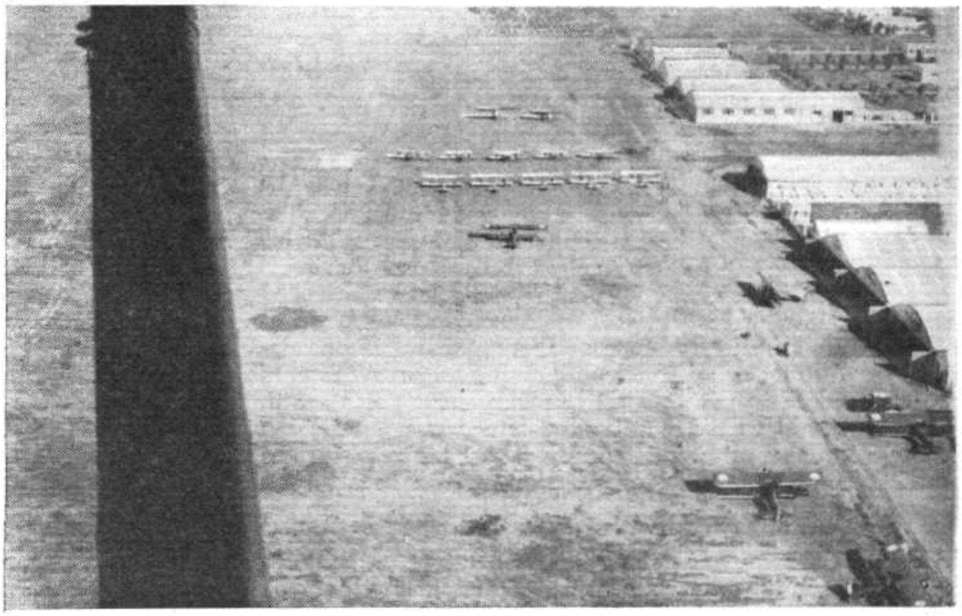
General Chiang Kai-shek, accompanied by his wife, arrived in Peking on October 24 in his private aeroplane after having completed an air tour of Hupeh, Honan, Shensi, Kansu, and Ninghsia.

Sir Phillip Sassoon Home

Sir Phillip Sassoon, Under-Secretary of State for Air, arrived at Croydon, in the Imperial Airways machine *Heracles*, on October 29, thus concluding his 20,000 miles' flying tour of the Far East. He was officially welcomed by Lt. Col. F. C. Shelmerdine, Director of Civil Aviation. During this tour Sir Phillip visited R.A.F. stations in Egypt, India, and Singapore.

Another Stratosphere Ascent

Dr. Jean Piccard, Prof. Auguste Piccard's twin brother, carried out a successful balloon ascent into the stratosphere from Detroit, U.S.A., on October 23. Dr. Piccard was accompanied by his wife, and the ascent occupied about nine hours, during which an altitude of ten miles was reached. The descent was made, not without some difficulty, in a forest near Cadiz, Ohio, the balloon's somewhat rapid fall being broken by trees, but without hurt to the occupants or instruments. The object of the ascent was to obtain further data regarding the cosmic rays, and not to attain a record altitude.



TUNIS: An aerial view of Tunis Aerodrome. In addition to the French military aeroplanes on the ground, the squadron of Avro 626 aircraft which recently flew out to Egypt from England, are also shown in this picture. Incidentally, these Egyptian machines reached Cairo on October 1.

Diary of Forthcoming Events

Club Secretaries and others are invited to send particulars of important fixtures for inclusion in this list

- **Nov. 2.** Norfolk and Norwich Aero Club Annual Ball, Norwich Aerodrome.
- **Nov. 8.** "Speeds of Commercial Aircraft." R.Ae.S. Lecture by M. Louis Breguet.
- **Nov. 15.** "Flying Boats." R.Ae.S. Lecture by Mr. I. I. Sikorsky.
- **Nov. 16-Dec. 2.** 14th International Aviation Exhibition, Grand Palais des Champs-Elysees, Paris
- **Nov. 21.** "The Royal Air Force Training Year At Home." R.U.S.I. Lecture by Wing Com. L. L. MacLean, R.A.F.
- **Nov. 22.** "Air Turbulence near the Ground." R.Ae.S. Lecture by Prof. Dr. Wilhelm Schmidt.
- **Nov. 23.** Lancashire Aero Club Ball, Midland Hotel, Manchester.
- **Nov. 28.** Hampshire Aeroplane Club Annual Ball, South Western Hotel, Southampton.
- **Nov. 29.** "Engine Research." R.Ae.S. Lecture by Capt. A. G. Forsyth.
- **Nov. 30.** Yorkshire Aeroplane Club Annual Ball, Hotel Majestic, Harrogate.
- **Dec. 6.** "Recent Progress of the Autogiro" R.Ae.S. Lecture by Senor Juan de la Cierva.
- **Dec. 13.** "Recent Research in Metallurgy." R.Ae.S. Lecture by Dr. W. H. Hatfield.
- **Dec. 18.** Herts and Essex Aeroplane Club Annual Dinner and Dance, Park Lane Hotel, Piccadilly, London.

PRIVATE FLYING

A SECTION FOR OWNER-PILOTS AND CLUB MEMBERS

NOTES by LORD SEMPILL A.F.C., F.R.Ae.S.

THE successful completion of a long flight in conditions such as those under which the MacRobertson air race was flown depends primarily on the reliability of the power unit. The strain imposed on the engine is relatively greater in such circumstances than that to which the aircraft structure itself is put.

Aeroplane designers to-day are able to produce aircraft knowing full well that they will function satisfactorily under gruelling conditions. Those responsible for the design of the "Comets" have proved how exact is this science so far as the construction of machines of the fixed wing variety are concerned. The modern aeroplane will not fail its pilot in fundamental flying qualities, although components of recent introduction, such as retractile undercarriages, of which designers have yet to gain experience, may let him down.

In an event of this kind, although the modern power unit is no whit less reliable than the aircraft itself, the pilot needs to give very close attention to the capacity of the engine; many a race has been lost by lack of restraint in the handling of the power unit. An early advantage gained by running an engine all out may be dearly bought at a later stage. The successful participator in a long distance race is he who knows just what his engine is capable of, and who does not ask too much.

The present-day power unit, in careful and experienced hands, will give a high performance over lengthy periods, provided that it has been properly prepared. If one demands continuous and efficient running, then every care must be taken to see that all its component parts are in first-rate condition. A faulty magneto or an ill-adjusted carburetter may mean just the difference between success and failure.

Preparing for a Long Flight

WHILST this close attention to detail is particularly necessary in preparing for a big race, it is no less desirable as a preliminary to a long flight undertaken in more leisurely conditions. The private owner who decides to use his aeroplane for a journey to one of the Dominions will not want to emulate the record breakers. He will do very well indeed if he keeps up a steady seven hours' flying day by day. This, with a rest of one day each week, would enable him to reach, say, Melbourne in eighteen or nineteen days

Such a flight would involve, on the average light aircraft of modern design, about 120 hours' flying, and a properly overhauled machine should be capable of completing such a journey, with minor adjustments *en route*, so long as the engine is run well within its capacity.

Before starting out on my flight to Australia my machine had done about 100 hours since last going into the shops. I therefore decided that my "Gipsy III," an engine which has so faithfully served its pilot on many a record flight, should be given a straightforward top overhaul.

Cylinder heads and pistons were removed and decarbonised. All rocker brackets were taken down, immersed in nitric acid, and scrutinised for cracks. Valve seats were recut to 30 deg., and valves reground. All inlet valves were found to be in good order, but three exhaust valves, being somewhat burned after 800 hours' running, were scrapped. It may be interesting to describe the effect of the use of upper cylinder lubricant which I have used recently. This overhaul gave an opportunity to judge its value, and there would appear to be no doubt that, used in the correct proportion to fuel, it has very beneficial results, some of which are indicated below.

In examining the various parts of the engine from this point of view, it was found that the upper portion of the cylinder, which is just swept by the piston, was in a far better condition than is usually the case. Instead of the cylinder at the end of the travel being rather dry and somewhat ingrained with carbon, it was free from carbon and well lubricated. In this case the pistons showed a somewhat heavier carbon deposit than usual, but this might have been due to using on certain occasions an excessive quantity of the upper cylinder lubricant, and to the fact that, prior to coming into the shops, the machine had been used for a series of short journeys. The carbon thus formed was of a kind that would no doubt have been burnt off on a long run where the engine had time to get thoroughly warmed up.

The neck of the valves, or that part above the guides, was also found to have more than the usual amount of carbon deposit, but with the engine running hot this would probably be burnt off in the same manner. In other respects the pistons were found to be in better condition than is normally expected. The upper land, or the part of the piston above the rings, instead of being, as usual, rather dry and ingrained with carbon, was well lubricated and showed no signs of ingrained carbon deposit on the working surfaces.

The valves and the valve guides, both exhaust and inlet, were in much better condition than normal, both indicating that they had been well lubricated. As a rule, valve stems and guides are dry, and signs of "picking up" are quite evident. It was obvious that the use of upper cylinder lubricant saved considerable expense on replacements which, in the ordinary way, is often a heavy item.

Upper Cylinder Lubrication

THE full advantage of using this lubricant is, of course, only obtained on unworn engines in good condition. Used on new or overhauled engines, there is no doubt that it obviates a great deal of the wear which results in running the engine from cold before the oil supply is warmed up and circulating properly. I have found also that the slow running of the motor was considerably improved. In practice I have the upper cylinder lubricant put into my starboard wing tank only. I warm up the engine from this tank, afterwards running on both, and, what I consider equally important, switch on to this tank again at the end of a flight, running the engine slowly for a minute or two before switching off. (*Continued on p.* 1151.)

To continue with the overhaul, the normal procedure was followed with, perhaps, rather closer inspection than usual. The carburetter was stripped down, jets calibrated, and float level checked up. The magnetos were taken down and thoroughly overhauled on the bench. This opportunity was taken to incorporate a small modification to the impulse drive, as laid down in Air Ministry Notice "G.E.27." Two flexible couplings to the magneto drive were also replaced. All rubber connections were renewed and engine controls adjusted, worn parts being replaced.

Finally, all instruments were checked up and recalibrated as necessary. One quite important minor operation might be mentioned in this connection, and that is the regraphiting of the revolution counter drive cable.

The engine cooling on a journey which involved crossing the Equator needed a little thought, as there was no room in the machine to carry a spare cowl. To overcome this problem it was decided to start off with a tropical cowl and to fit into the frontal aperture or louvre a small shield which would reduce the opening to the normal for flight in temperate climates, and which could be removed when the tropical zone was reached.

FROM THE CLUBS

Events and Activity at the Clubs and Schools

LIVERPOOL AND DISTRICT

The total flying time for the past week at both Hooton and Spëke was 48 hr. 30 min., which included 4 hr. 50 min. night flying.

CAMBRIDGE

Flying times for last week at Marshall's School were 22 hr. dual and 15 hr. solo. Three new members joined, and there is another private owner member—Mr. F. W. Green, who has bought a Klemm Salmson.

WITNEY AND OXFORD

High winds curtailed flying on several days last week, so that the total flying time amounted to only 24 hr. Mr. H. F. R. Sewell passed his tests for his "A" licence, and a new associate member has joined the club—Mr. Tozer.

HERTS AND ESSEX

The dance held on October 25 was well attended, and proved to be a very enjoyable evening for everyone. The flying times for last week were 25 hr. dual and 26 hr. solo. A first solo was accomplished by Mr. W. I. Scott-Hill, and Mr. L. Pyle made his "A" licence test. Four new members have joined the club. A snooker match will be held on November 8 against a visiting club.

BROOKLANDS

Weather was not too kind to pupils last week, and the added attraction of going up to Mildenhall for the start of the race lured away members on Friday, so that flying was not resumed until Saturday afternoon. Nevertheless, flying hours remained good, being 29 solo and 80 dual, total 109 hr.

The cold weather has not deterred two new members from joining.

Mr. Downing has passed his "A" tests. Visitors to the aerodrome included the directors of Airspeed, in one of the new "Envoy" machines, which excited much admiration. On Sunday a very successful tea dance was held in the club, supported by a large number of visitors by air.

Five students of the College passed their "X" tests for their parachute licence. They are Messrs. Bickerton, Hoare, Donaldson, A. Wedderburn, and Hector. The Aeronautical College of Engineering has started a Rugby football team, and has already made several fixtures.

Mr. Chizik is taking delivery of his new "Tiger Moth," which he proposes to fly to Palestine. This machine is to be the first aircraft of a flying club which he is forming out there.

CARDIFF

Bad weather prevented flying on two days last week; the total flying times for the week were 8 hr. 45 min dual, 1 hr. 25 min. solo, and 35 min. tests.

CINQUE PORTS

There being a distinct improvement in the weather last week, total flying times totalled just over 41 hr. Four new members have joined the club. Some excitement was caused during the week by the preparations for Col. Fitzmaurice's start to Australia in the *Irish Swoop*.

BENGAL

During September the club has put in a total of 84 hr. 35 min., showing that, in spite of heavy rainfall and consequent state of the aerodrome, there has been considerable activity during the period under review. Messrs. S. N. Chowdbury and A. S. M. Ali Ashraf both passed their tests for "A" licences, and three members made first solos. The total membership of the club is now 291, three aircraft are in club use, and three are privately owned.

HATFIELD

The flying time last week at the London Aeroplane Club totalled 69 hr. 15 min. Mr. N. Hurst carried out his first solo flight, and two new members have joined the club.

On Saturday, October 20, it was at last possible to hold the navigator's competition for the cup presented by Mr. E. Hicks, the winner being Mr. A. H. Cook. The judges had a very arduous and difficult task in deciding the winner, as Messrs. Matusch, Sprosen, Mills and Young were very close finishers.

NORFOLK AND NORWICH

Most of last week's flying was instructional, and a number of qualified pilots took the opportunity of taking advanced or refresher courses with Mr. J. Collier. During the week Mr. F. Low and Mr. Collier flew over Yarmouth and obtained a number of air photographs of the herring fleet. Some six members received instruction from Mr. Collier, and eleven members went solo. Members have received an invitation from the Norwich Engineering Society to attend a lecture on "The Engineering Aspect of Civil Aviation" at the Stuart Hall on Monday, November 12, at 8 p.m. This is being given by Mr. F. W. Hewitt, of the Imperial Airways. To-morrow, November 2, the annual ball is being held at the aerodrome, the hangar adjoining the club house having been lent by Boulton and Paul, Ltd., for use as a ballroom.

The Future of Hanworth Club

General Aircraft, Ltd., have acquired the property known as the Hanworth Club and London Air Park, Feltham, and have granted a forty-two-years' lease of the aerodrome to Major F. S. Moller, M.C., D.F.C., and Mr. B. Brady (managing director of Aircraft Exchange and Mart, Ltd.), who will control the flying school and the aerodrome.

A new syndicate, to be known as London Air Park Club, Hanworth, is being formed, the directors of which are Major T. S. Ruttle and Mr. Robert Blackburn, with the lessees as managing directors. The club is primarily intended for flying pupils, but will be open also as a social country club for people who may not be interested in aviation. The addition of a squash court and a swimming pool is, among other improvements, under consideration.

The resident manager will be Mr. Harry Dolacombe, who was very well known in the earlier days of flying.

Imperial Airways' Profits

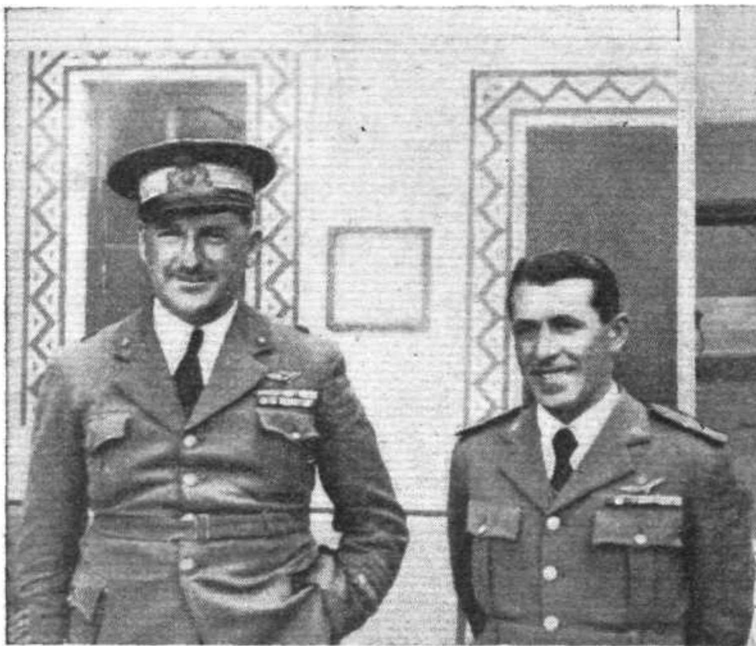
The annual report of Imperial Airways, Ltd., indicates, for the year ending on March 31, an increase of £25,677 net profit, and a dividend of 6 per cent. is recommended on the ordinary shares. The actual net profit was £78,571.

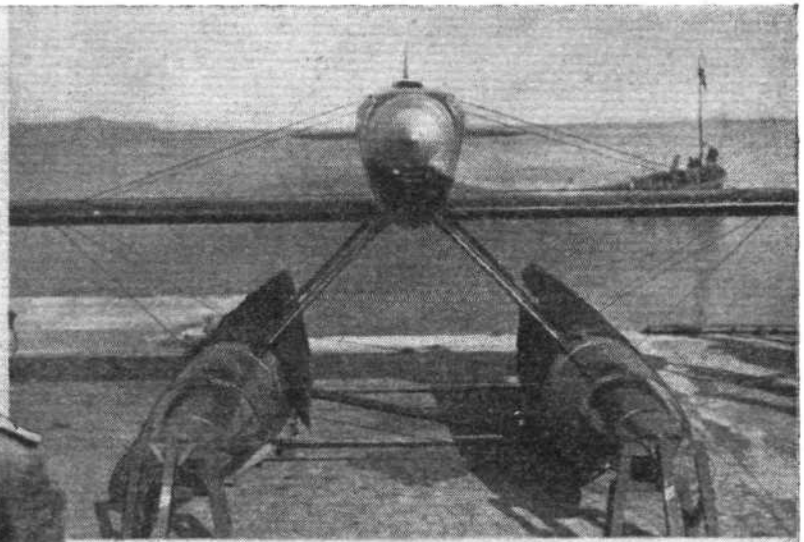
Some of the figures given are illuminating. Traffic on the South African route, for instance, increased by 42.4 per cent., and on the Karachi service by 33.4 per cent. During the year 50,945 passengers were carried and 2,354,176 miles were flown, apart from charter and pleasure flying.

The year under review completes a decade of operation by the Company. The fleet at present consists of seven flying boats—four of them "Calcuttas"—and of twenty-five landplanes, apart from those operated on special charters and by subsidiary companies. Some seven of the latter are marked as being under construction, and these may be taken as including D.H.86s and the new Boulton and Paul and Avro feeder line machines

THE SPEED RECORD RAISED

Warrant-Officer Agello Achieves a Mean Speed of over 440 m.p.h. with the Fiat-engined Macchi-Castoldi 72 at Lake Garda





AT DESENZANO: Scenes after the successful speed record attempt. Above, Col. Bernasconi, Commandant of the Italian High-speed Flight, and Warrant Officer Agello. The upper picture on the right shows the clean design of the Macchi-Castoldi 72. On the right is seen the machine as it was being brought ashore after the flight. Note the wing surface radiators and oil coolers on the floats.

FLYING the Macchi-Castoldi 72 seaplane (3,000 h.p. special 24-cyl. Fiat) at Lake Garda on Tuesday of last week, Warrant-Officer Francesco Agello, of the Italian Royal Air Force, raised his own world's air speed record by putting up a mean speed (subject to homologation) of 709,202 km./hr. (440.677 m.p.h.) for the usual four flights. His previous record stood at 682,403 km./hr. (423.76 m.p.h.).

The weather conditions under which the attempts were made were ideal, there being just sufficient breeze to take the glassiness off the water, so assisting the take-off. Temperature was suitable, and the air was free from bumps.

Just before 3 p.m. Agello took off and made four runs over the three-kilometre course, clocking as follows:—

	Secs.	km./hr.	m.p.h.
North-South	$15\frac{29}{100}$	705.882	438.614
South-North	$15\frac{19.2}{100}$	710.433	441.423
North-South	$15\frac{18.1}{100}$	711.462	442.081
South-North	$15\frac{23.4}{100}$	709,034	440.738

After the successful attempt a banquet was held in the Officers' Mess at Desenzano in Agello's honour. The speeds were announced, and Col. Bernasconi, who is in command of the High-speed Flight, stated that Signor Mussolini had honoured Warrant-Officer Agello by promoting him to a full lieutenant.

Only a few modifications had been made to the Macchi-Castoldi since the previous attempt, chief among them being the substitution of wooden floats for the metal ones previously used.

As is well known, the most interesting feature of the machine is the extremely unconventional power-unit, the Fiat A.S.6. The problem of frontal area for such a powerful unit as was specified was solved by placing the twenty-four cylinders (totalling in capacity over fifty litres) in two rows, forming a 60 deg. "vee," and, further, arranging them in two mechanically independent groups.

Each group has its own crank shaft, but a single crank case is used for both. The crank shafts, which rotate in opposite directions, are coupled in the centre by spur-gear reduction units, which drive two airscrew shafts. One of these shafts is hollow, and the other operates within it. The two shafts run forward through the "yee" of the front engine unit, and each carries an airscrew; so that there are two of the latter, close together, but revolving in opposite directions.

Each engine unit has independent camshafts (two per engine), water pump and dual Marelli magnetos, but a common induction system is used, an eight-jet carburetter being mounted behind the rear unit and mixture being drawn from it and passed to the cylinders by a supercharger geared up to 20,000 r.p.m. An interesting point is that this supercharger absorbs 200 h.p., and, since it is driven by the rear engine, the blades of the front airscrew (which the rear engine drives) are given a different inclination to correct the slight difference in power.

The power units develop 3,000 h.p. at 3,200 r.p.m., and weighs 2,045lb., giving a weight per h.p. of 0.706lb. The all-up weight of the machine, with pilot and full tanks, is 6,670lb

British equipment figured in the success, for Castrol oil and K.L.G. plugs were used.

The AIRCRAFT ENGINEER

"FLIGHT" ENGINEERING SECTION

Edited by C. M. POULSEN

No. 105 (Volume IX No. 10) 9th Year November 1, 1934

FIGURES OF MERIT

From the earliest days of Flying, comparisons of the "Goodness" of one type of Aeroplane with another have been difficult. The "Everling Quantities," particularly the "High-speed Figure," have been used by "Flight" for several years. To them Mr. Rodger now adds another, the "Lift Ratio"

By R. RODGER

1.—*Introduction*

FOR some years now it has been the custom of FLIGHT, when offering technical descriptions of new types of aeroplanes, to assess the approximate relative efficiencies, both aerodynamic and structural, of such aeroplanes on a "figure of merit" basis. A bald statement of facts does not seem to create a clear-cut impression of relative values whereas the figure of merit, or index figure, possesses the distinct practical advantage of immediately emphasising one's ideas in a general sense. The statement of speed range as, say, 165–63 m.p.h. is less impressive than the corresponding ratio of 2.6, the single ratio at once providing a clue as to whether the aeroplane is good, bad, or indifferent in the particular characteristic under consideration. The example quoted is, of course, quite elementary, but the idea can, with advantage, be elaborated upon as, for instance, in the Everling Quantities.

On the other hand, however, the figure of merit should not be regarded as an absolute measure of efficiency. A machine may have special features inherent to the type which account for a poor figure of merit and *apparently* inferior design. One such example which comes readily to mind is the case of the large civil aeroplane. Fitted out as, say, a 15–20-seat transport, such an aeroplane would require internal cabin furnishings of not inconsiderable weight. Converting the same machine into a freighter of identical gross weight, most of the internal cabin furnishings—seating, upholstery, lavatory, etc.—could be dispensed with, and would, in fact, be replaced by pay load, i.e., freight. As a transport such a machine might quite possibly show a somewhat indifferent value for the ratio of gross weight to tare weight, whereas as a freighter the value of the same ratio might be passably good. Under these circumstances it is obvious that the figure of merit is a misnomer and conveys an entirely erroneous impression because the true structural efficiency in both cases would be substantially the same.

In comparing aeroplanes of more or less similar type, the figure of merit may reasonably be accepted as direct evidence. Where any appreciable divergence of type exists, however, it is desirable, probably essential, that more or less detailed information regarding the design should be available if the figure of merit is to assume its proper significance.

2.—*Symbols*

For ready reference and in order to keep the subsequent text clear, the various symbols used and the significance attached thereto have been tabulated as under.

W	=	gross weight (weight fully loaded), in lbs.
W_T	=	tare weight (weight empty), in lbs.
V	=	speed level flight, in m.p.h.
V_c	=	climbing speed, in m.p.h.
P	=	engine(s) b.h.p.
$f(h)$	=	factor for variation of engine power with height.
THP_R	=	thrust horse-power required.
THP_A	=	thrust horse-power available.
η	=	airscrew efficiency.
L	=	lift, in lbs. $= k_L \rho S V^2$
D	=	overall drag, in lbs. $= k_D \rho S V^2$
k_L	=	absolute lift coefficient.
k_D	=	absolute overall drag coefficient.
ρ	=	air density.
S	=	wing surface, in sq. ft.
s	=	semi-span, in ft.
D_i	=	induced drag, in lbs.
ϵ	=	angle of induced downwash.
ω	=	induced downwash velocity.
σ	=	relative air density.
p	=	air pressure at height.
p_0	=	air pressure at sea level.

3.—The Weight Ratio

The simple proportion of the gross weight (weight fully loaded) to the tare weight (weight empty) has been termed the weight ratio and is assumed to be indicative of the structural efficiency, thus,

$$\text{Weight ratio} = \frac{W}{W_T} \quad \ldots \quad \ldots \quad (1)$$

Mention has already been made of one precaution to be observed when comparing the weight ratios for dissimilar types. Another item which has a marked influence is, of course, the load factor, and as this is usually graded off against gross weight the question of size is also involved.

Tare weight is defined here as the gross weight less the disposable load, the latter item comprising crew, fuel, oil and pay load or military load, as the case may be. The tare weight is sometimes inconsistently quoted in press descriptions and misleading weight ratios result. Attention will be drawn to this point again later on.

4.—The Speed Range Ratio

The simple proportion of the maximum flying speed to the minimum flying speed has been termed the speed range ratio, thus,

$$\text{Speed range ratio} = \frac{\text{Vmax.}}{\text{Vmin.}} \quad \ldots \quad \ldots \quad (2)$$

Here again ambiguity occurs in press descriptions as regards the minimum flying speed. Sometimes the stalling speed is quoted, sometimes the landing speed. The writer is of the opinion that the latter is the more important and should be standardised as the minimum speed.

5.—Wing Power

This term was, the writer believes, first introduced by Prof. E. Everling in connection with the now well-known Everling Quantities. It is a combination of the wing loading and the power loading in which the gross weight term is eliminated, thus,

$$\text{Wing power} = \frac{P}{S} \text{ in h.p./sq. ft.} \quad \ldots \quad (3)$$

In FLIGHT the two principal loadings—wing and power—are nearly always quoted, even when the horse-power and/or wing area are omitted, and it is, therefore, sometimes useful to consider the wing power in terms of these two principal loadings, thus,

$$\frac{P}{S} = \frac{W}{S} \times \frac{P}{W} = \frac{W}{S} \Big/ \frac{W}{P} = \frac{\text{Wing loading}}{\text{Power loading}} \quad \ldots \quad (4)$$

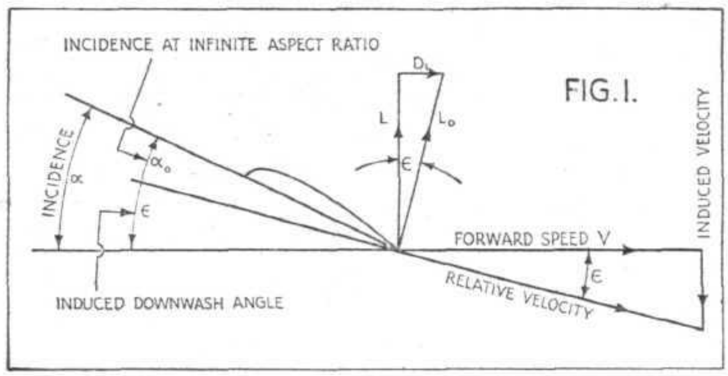
6.—Span Loading

In the opinion of the writer this quantity does not appear to be very well named as one might quite reasonably expect it to express load carried per unit run of span, say, lbs./ft. run. Actually its arithmetical significance is "span squared divided by gross weight," and as British nomenclature usually deals with the semi-span, the quantity is generally quoted as

$$\text{Span loading} = \frac{4s^2}{W} \quad \ldots \quad \ldots \quad (5)$$

The span loading is a qualitative indication of the induced drag, a high value for span loading being associated with low induced drag. Its significance will be better understood with the aid of a little simple arithmetical derivative analysis.

The total drag of an aeroplane wing is equal to the sum of the profile drag and the induced drag. The profile drag is dependent on the wing section and its attitude, and is proportional to the wing area and the square of the air speed. It is unaffected by span, aspect ratio and truss arrangement. The value of the induced drag is proportional to the square of the lift and inversely proportional to the square of the span and the square of the air speed. It is independent of wing section and aspect ratio. This is true for all trusses, except that in the case of multiplane systems—two or more superimposed aerofoils—the induced drag is also a function of the gap/span ratio. "Span squared over weight" is, however, the preponderating factor and the influence of gap/span ratio is relatively small. Profile drag may be considered as included in the parasite drag group, the important ratio for the wings being the lift/*induced* drag ratio.



Referring to Fig. 1,

$$D_i = L \tan \epsilon$$

but,

$$\tan \epsilon = \frac{\omega}{V}$$

hence,

$$D_i = \frac{\omega L}{V} \quad \ldots \quad \ldots \quad (6)$$

The induced downwash velocity, ω, has been correlated by Prandtl with several main features of the aerofoil, assuming a distribution of lift along the span according to a semi-ellipse, thus,

$$\omega = \frac{2L}{\pi\rho V(2s)^2}$$

Substituting in (6),

$$D_i = \frac{2L^2}{\pi\rho V^2(2s)^2}$$

or,

$$\frac{L}{D_i} = \frac{\pi\rho V^2(2s)^2}{2L}$$

Substantially,

$$L = W$$

therefore,

$$\frac{L}{D_i} = \frac{\pi\rho}{2} \cdot \frac{4s^2}{W} \cdot V^2$$

or,

$$\frac{\text{Lift}}{\text{Induced drag}} = 0.008 \times \frac{\text{Span}^2}{\text{Weight}} \times V^2 \quad \ldots \quad \ldots \quad (7)$$

where, V = the indicated air speed, in m.p.h.

7.—The Everling Quantities

These figures of merit were enunciated originally about eight years ago by Prof. E. Everling in the German periodical, *Zeitschrift fur Flugtechnik und Motorluftschiffahrt*, a translation of the article being presented in THE AIRCRAFT ENGINEER, dated November 25, 1926. In this translation the original Continental units and symbols were retained, a rather unfortunate feature in the writer's opinion.

(The Continental units were retained because they enabled a direct comparison to be made between British and Foreign machines, of which many are described in "Flight." Otherwise one would have corresponding "High-speed Figures" of one nationality twice the value of those of another.—Ed.)

Transformed into British units and symbols, the Everling Quantities reduce to quite simple expressions of a form appealing strongly to the practical reader. Their origin, however, becomes somewhat obscure in the process, and the various steps in their derivation are completely masked by the introduction of numerical coefficients into the final formulæ.

Using British units and symbols the three Everling Quantities are generally defined as follows:—

$$\text{High speed figure} = \frac{\eta}{2k_D} = \frac{V^3}{147{,}000} \cdot \frac{S}{P} \cdot \frac{\sigma}{f(h)} \quad \ldots \quad \ldots \quad (8)$$

$$\text{Distance figure} = \eta \frac{L}{D} = \frac{V}{375} \cdot \frac{W}{Pf(h)} \quad \ldots \quad \ldots \quad (9)$$

$$\text{Altitude figure} \quad = \eta\frac{L}{D}\sqrt{2k_L} = \frac{1}{18.95}\cdot\frac{W}{Pf(h)}\cdot\frac{\sqrt{\frac{W}{S}}}{\sqrt{\sigma}} \quad (10)$$

Each of these general formulæ is derivable from the standard equations for level flight as explained in the subsequent notes. For the benefit of the non-technical reader very complete derivations have been given and the various steps have been kept as simple as possible.

(It would appear that Mr. Rodger is unaware of the fact that an article on the subject of comparison of aircraft performances, by Mr. H. A. Mettam, M.A., A.F.R.Ae.S., was published in "The Aircraft Engineer," of February 24, 1927, in which the Everling Quantities were derived in British symbols and units, and a comparison made between them and the "Coales Curves."—Ed.)

8.—The High Speed Figure

For top speed level flight at any height,

$$THP._A = THP._R$$

But,
$$THP._A = \eta P \quad \ldots \quad (11)$$

and
$$THP._R = \frac{DV}{375} \quad \ldots \quad (12)$$

Equating (11) and (12),

$$\eta P = \frac{DV}{375} \quad \ldots \quad (13)$$

By definition,
$$D = k_D\rho SV^2$$

Substituting in (13),

$$\eta P = \frac{k_D\rho SV^3}{375} \quad \ldots \quad (14)$$

Now, as mentioned above, the original Everling Quantities were evolved in Continental units, and as it is often desirable to compare British aeroplanes directly with Continental types, it is advisable to render the formulæ expressing the Everling Quantities in British units and symbols at once comparable with those in Continental units, thus eliminating the necessity for laborious and irritating conversions. The Continental coefficients for lift and drag, C_A and C_W, are *double* the corresponding British coefficients k_L and k_D, and making allowance for this in (14) we have,

$$\eta P = \frac{2k_D SV^3}{375}\cdot\frac{P}{2}$$

or,
$$\frac{\eta}{2k_D} = \frac{\rho/2}{375}\cdot\frac{SV^3}{P}$$

For m.p.h. units, $\rho = 0.0051$ at sea level, whence,

$$\frac{\eta}{2k_D} = \frac{0.0051}{750}\cdot\frac{SV^3}{P}$$

or,
$$\frac{\eta}{2k_D} = \frac{V^3}{147{,}000}\cdot\frac{S}{P} \quad \ldots \quad (15)$$

This is the High-speed Figure at sea level so familiar to readers of FLIGHT, where,

V = top speed level flight, in m.p.h., at sea level.
P = maximum b.h.p. at sea level.

In (15) the term $\frac{S}{P}$ is obviously the reciprocal of the wing power, whence,

$$\text{High-speed figure} = 0.0000068\,\frac{V^3}{\text{Wing power}} \quad \ldots \quad (16)$$

a form which is sometimes handier than (15).

Air density decreases with height above sea level, hence the value of ρ is proportionately less than 0.0051 at height H feet above sea level, and the fraction $\frac{1}{147{,}000}$ is correspondingly reduced. The ratio of the air density at height H to the density at sea level is indicated by the symbol σ, the relative density, by which value (15) must be multiplied.

For normally aspirated engines the power output is reduced with height, but it is still a controversial point as to whether the variation follows more nearly the pressure or the density law. The favoured method in modern practice appears to be a fifty/fifty compromise between pressure and density, such that

$$f(h) = \tfrac{1}{2}\left(\frac{P}{P_0} + \sigma\right)$$

In any case, the term P in (15) must be multiplied by $f(h)$ to allow for height, and introducing the entire "height factor" we have,

$$\frac{\eta}{2k_D} = \frac{V^3}{147{,}000}\cdot\frac{S}{P}\cdot\frac{\sigma}{f(h)} \quad \ldots \quad (8)$$

where

V = top speed level flight, in m.p.h., at height H ft. above sea level.
P = maximum b.h.p. at sea level at r.p.m. appropriate to V.

Note particularly the significance attached to P, which suffers a two-fold reduction due to (i) the airscrew characteristics which limit the r.p.m., and therefore the b.h.p. which the airscrew can absorb in torque, in relation to the forward speed V, and (ii) the deficient carburation due to the reduced barometric pressure and/or air density. Still further complications arise in the case of engines which are not normally aspirated, i.e., supercharged engines which develop their full power at some rated height, or ground boosted engines substantially maintaining their power up to some considerable altitude.

It will be obvious that values for the High-speed Figure are determinate from any set of level flight performance data at any height, but only one of such results will be the one required, i.e., the optimum. For an accurate estimate of the High-speed Figure under all conditions it is, therefore, necessary to possess data for top speed level flight over a wide range of heights, variation of engine speed with aircraft speed, variation of b.h.p. with engine speed at sea level, and variation of b.h.p. with height.

Such data are generally outside the scope of type technical descriptions appearing in FLIGHT, and the reader is usually confined to (15) for his comparison. This is fairly satisfactory if approximately similar types fitted with normally aspirated engines are being compared. When, however, other special features, such as those mentioned above, are characteristic to the aeroplane, one should use (8), and certain suggestions on this point will be made later.

9.—The Distance Figure

Very simply,

Distance (miles) = Duration (hrs.) × Speed (m.p.h.)

but,
$$\text{Duration} = \frac{\text{Fuel supply (lbs.)}}{\text{Consumption (lb./hr.)}}$$

and

Consumption = Specific consumption (lb./b.h.p./hr.) × b.h.p.

whence,

$$\text{Distance (miles)} = \frac{\text{Fuel supply (lb.)}}{\text{Specific consumption (lb./b.h.p./hr.)}}\times\frac{\text{Speed (m.p.h.)}}{\text{b.h.p.}}$$

The specific consumption of the engine is here considered to be substantially constant over the entire range, the effects of height and throttling being ignored for present purposes; hence, for a given fuel supply,

$$\text{Distance} \propto \frac{V}{P}$$

and this ratio $\frac{V}{P}$ is then itself a figure of merit for maximum range when the engine is *throttled to give the maximum value of the ratio.*

At any speed level flight with the engine appropriately throttled,

$$THP._A = THP._R$$

whence, as before,
$$\eta P = \frac{DV}{375} \quad \ldots \quad (13)$$

or,
$$\frac{\eta}{D} = \frac{V}{375P}$$

Substantially,
$$W = L$$

whence,
$$\eta\frac{L}{D} = \frac{V}{375}\cdot\frac{W}{P}$$
or, introducing the "power factor,"
$$\eta\frac{L}{D} = \frac{V}{375}\cdot\frac{W}{Pf(h)} \quad \cdots \quad \cdots \quad \cdots \quad (9)$$
where,

V = any speed level flight, in m.p.h., at any height H ft.

$Pf(h)$ = b.h.p. with engine throttled to give $THP_A = THP_R$ at speed V.

Again note carefully the significance attached to the power term. In the case of the High-speed Figure we were dealing only with one specific point in the power curves, i.e. the intersection of the curves for THP_A at full throttle and THP_R as indicating the maximum speed level flight at the particular height considered. At some speed V_X substantially below the maximum speed there will be excess power available at full throttle, and the machine will climb. To maintain level flight at speed V_X it is thus necessary to throttle the engine so that THP_A (throttled) equals THP_R at speed V_X.

This process can be repeated for all speeds and all heights within the flying range, so that obviously almost innumerable THP_R and THP_A (throttled) curves may be calculated. Only one pair of these, however, will determine the Distance Figure, the pair required being, as previously stated, that which gives the maximum ratio of speed level flight to power. This ratio is really analogous to the "miles per gallon" figure so familiar to motorists.

The reader will now appreciate why the Distance Figure is seldom, if ever, referred to in type technical descriptions, an intimate knowledge of both machine and engine performance being essential if the Distance Figure estimate is to serve any useful purpose as a comparison. Such data is, of course, quite outside the scope of the usual technical descriptions.

10.—The Altitude Figure

For steady climbing flight,
$$V_c = \frac{375}{W}(THP_A - THP_R)$$
or, by previous reasoning,
$$V_c = \frac{375}{W}\left(\eta P - \frac{K_D \rho S V^3}{375}\right) \quad \cdots \quad \cdots \quad (17)$$

If a climb be commenced at sea level with the aeroplane in the attitude corresponding to minimum power required, and this altitude be maintained throughout the climb right up to the absolute ceiling, the optimum rate of climb will not be realised at low altitudes, but the final altitude reached will remain unaffected. Assuming (17) to apply to such sea level conditions, then,

V = speed level flight, in m.p.h., corresponding to minimum power required.

P = b.h.p. at full throttle at engine r.p.m. appropriate to V.

Since the altitude of the aeroplane is assumed to remain constant throughout the climb, the overall drag coefficient, k_D, will also remain constant. But the mass density of the air will decrease with height, hence, for constant resistance, the speed level flight will increase with height. Therefore, at the ceiling the speed level flight, V, will have increased to $V/\sqrt{\sigma}$. Also, as previously, power will fall off with height in accordance with f(h). Thus, at the absolute ceiling, (17) becomes,
$$V_c = \frac{375}{W}\left[\eta Pf(h) - \frac{DV}{375\sqrt{\sigma}}\right]$$
At the ceiling,
$$V_c = O$$
whence,
$$\eta Pf(h) = \frac{DV}{375\sqrt{\sigma}}$$

For steady climbing flight, approximately,
$$W = L$$
hence,
$$\frac{\eta Pf(h)}{W} = \frac{DV}{375\sqrt{\sigma}}\cdot\frac{I}{L}$$
whence,
$$\eta\frac{L}{D} = \frac{V}{375}\cdot\frac{W}{Pf(h)}\cdot\frac{I}{\sqrt{\sigma}} \quad \cdots \quad \cdots \quad \cdots \quad (18)$$
By definition,
$$V = \sqrt{\frac{W}{K_L \rho S}}$$
or, allowing for the difference between British and Continental units,
$$V = \sqrt{\frac{W}{2K_L P/2S}}$$
Substituting in (18),
$$\eta\frac{L}{D} = \frac{\sqrt{\frac{W}{2K_L P/2S}}}{375}\cdot\frac{W}{Pf(h)}\cdot\frac{I}{\sqrt{\sigma}}$$
or,
$$\eta\frac{L}{D}\sqrt{2K_L} = \frac{1}{375P/2}\cdot\frac{W}{Pf(h)}\cdot\frac{\sqrt{\frac{W}{S}}}{\sqrt{\sigma}}$$
whence, writing $\rho = 0.0051$ for m.p.h. units,
$$\eta\frac{L}{D}\sqrt{2K_L} = \frac{I}{18.95}\cdot\frac{W}{Pf(h)}\frac{\sqrt{\frac{W}{S}}}{\sqrt{\sigma}}$$
where,

P = b.h.p. at full throttle at sea level at engine r.p.m. appropriate to the ceiling speed.

σ and f(h) have values appropriate to the absolute ceiling.

11.—The Lift Ratio

This is a figure of merit which the writer is suggesting here for, he believes, the first time. At least, he has never seen anything of a similar nature quoted previously in technical descriptions of new types of aeroplanes. The suggested figure of merit has the following significance,
$$\text{Lift Ratio} = \frac{K_L\text{max (from machine characteristics)}}{K_L\text{max (from aerofoil characteristics)}}$$
By definition,
$$L = K_L \rho S V^2$$
or,
$$K_L = \frac{L}{\rho S V^2}$$
Substantially,
$$L = W$$
Then,
$$K_L = \frac{W}{S}\Big/\rho V^2$$
Whence, from machine characteristics,
$$K_L\text{max.} = \frac{\text{Surface loading}}{\rho\ (\text{V landing})^2}$$

The other value, $K_L$max. from aerofoil characteristics, is the full scale maximum lift coefficient for the basic aerofoil independent of such auxiliaries as slots, flaps, etc., and is determinate, with appropriate corrections, from tunnel data.

The object of the Lift Ratio is to indicate to what extent the designer has cheated the basic laws of aerofoils by using flaps and/or slots, and by general layout of his wing truss to avoid loss of lift by interference and to take advantage of cushioning effects near the ground, short landing run, etc.

It is suggested that the ratio might be useful in making preliminary estimates for a proposed new design by taking the landing speed as a datum and deriving the other quantities therefrom. In any case it would add to the value of type technical descriptions.

(*To be concluded in our next issue.*)

TESTING THE FILM STRENGTH OF LUBRICANTS

A Machine Which Also Measures Friction and Wear

A SIMPLE machine has been designed which, it is claimed, gives accurate information on the load-carrying capacity of lubricants. The machine also measures friction and calculates the wear-resisting properties of materials. It is manufactured by British Timken, Ltd., the makers of tapered roller bearings.

Until recently reliable information of this character had been obtainable only through complicated and expensive laboratory research. The new machine has therefore proved a boon, not only to manufacturers and users of lubricants, but also to producers of all kinds of materials.

The Timken lubricant and wear-testing machine was developed during research work in the company's laboratories. Originally it was used for obtaining measurements of the film strength of lubricants. Later it was improved and adapted to perform the three functions mentioned. The general appearance of the machine is as shown in Fig. 1. Fig. 2 shows the essential details of the load and testing lever system. The main features of the device are the lubricant container and return pump, the lever system, and the arrangements for direct or belt drive. The lubricant container holds about a gallon of lubricant, which can be raised to and maintained at any temperature up to 210 deg. Fahr. by means of an electric hotplate. When the machine is in use the lubricant under test is constantly circulated by means of a pump in the base.

The Lever System

The lever system consists of two levers, one above the other. The upper lever, carrying the test block, is known as the "load lever" and is pivoted on a knife-edge mounted in the lower or "friction lever." The latter, which is also pivoted on a knife-edge, has a stop at the unloaded end, and is provided with a Vernier scale and a sliding weight for obtaining accurate measurements.

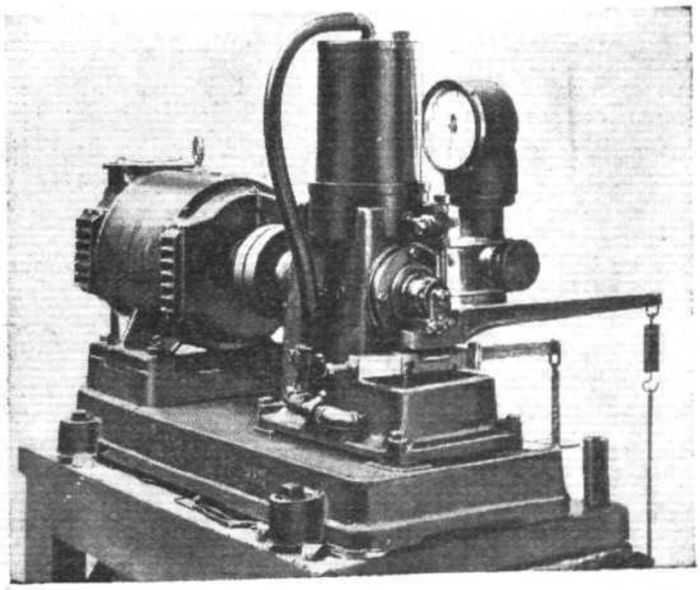


Fig. 1: The Timken lubricant and wear-testing machine.

A tapered mandrel carries the testing cup, and a notch in the adapter carried on the load lever is provided to take the test piece. Friction is measured between cup and test piece, and lubricant from the container flows regularly between the two contacting surfaces. The arrangement of the levers ensures that the test piece is always in the same position relative to the revolving cup and that the unit-loading over the length or surface of the two test pieces is always constant.

Provision is made for either direct or belt drive by means of a 2 h.p. synchronous speed electric motor. An 8in. pulley with a 3in. face is mounted on an extension of the mandrel, and a keyway is provided so that the motor may be coupled direct to the mandrel if desired.

The oil pump is mounted in the base of the machine, and is driven from the testing mandrel. In operation the lubricant from the container flows over the test piece, the rate of flow being controlled by means of a valve in the pipe line. It then enters a sump, whence it is pumped back to the container. The mandrel is mounted on two Timken tapered roller bearings to preserve positive alignment, and is tapered at the end opposite the drive to receive the test cup.

Test Procedure for Lubricants

In using the machine for testing the film strength of lubricants, both test pieces, that is the cup and the block, are usually made of carburised steel, hardened to 60 deg. C. Rockwell and ground. Four tests may be carried out with one test block, but each new test requires a new cup or a reground surface of the cup. Newly ground faces on both pieces are necessary to ensure accurate and uniform results.

Assuming both test pieces are in position, and the lubricant is heated to the required temperature, the driving motor is brought up to the desired speed and the lubricant is allowed to flow over the test block. The loading lever is then loaded by means of weights until the desired unit pressure is obtained. The full load should be applied at once rather than gradually, because the first few seconds of operation determine the possibility of sustaining loads when near the scoring point.

Breakdown tests are usually run for a period of ten minutes, and the surface of the block after test is the final check. If the surface is very scratchy or scored, then the load-carrying capacity of the lubricant has been exceeded. Rubbing speeds vary according to the type of test, and as an example it may be observed that lubricants for automobile rear axles are usually tested at 400 r.p.m. (800 r.p.m. of the spindle). Light oils, such as free-wheeling lubricants and motor oils, are tested at 200 r.p.m.

Greases may be tested by using a special chamber which surrounds the test pieces. The chamber is filled with grease before the tests begin, and is kept filled by adding grease from a screw-down container, which is interchangeable with the oil container supplied with the machine. Care must be taken to add grease at a constant rate in order that tests may be truly comparative.

Use of a Chart

A chart provided with the machine shows the number of lb. avoirdupois placed on the loading lever in terms of 1,000 lb. of unit pressure on the test pieces. The chart also shows the turning speed necessary to produce any given rubbing speed, both by direct and belt drive.

Standard formulæ for use with the machine are given on the charts. Reference to Fig. 2 in conjunction with the following list of symbols used will make clear the method of taking readings and calculating results:

A. Weight on the load lever.
B. Weight on the friction lever.

over the whole area. The flanges, too, are strongly tied together at the centre, while having freedom to give under load at their outer edges. Fig. 4 indicates in an exaggerated manner the effect on the bearing of the central web and shows the unhappy load distribution. Fig. 5 shows the improved loading with removal of web from shell metal.

Whilst the deflections indicated in Fig. 4 are of a fairly small order, they are sufficient to make themselves felt through the thin film of lubricant in the bearing with consequent ill-effects.

Turning back to the question of eliminating the web in the ordinary I-section rod, this, of course, applies only to the bearing shell and not to the shank of the rod. So long as the bottom end of the web does not bear on the shell metal, the shank of the rod need not differ from existing design.

Fig. 6 shows diagrammatically the ultimate design aimed for, and, if necessary, the flanges may be locally thickened at "A" to compensate for the removal of web at this section. The lightness of this construction will readily be appreciated when compared with the usual type, which tends towards complete solidity and rigidity, especially in the larger rods.

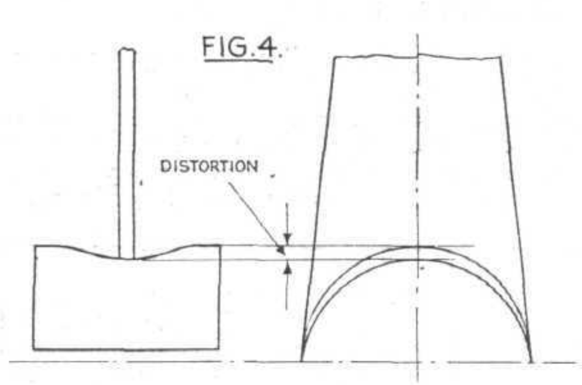


FIG.4.

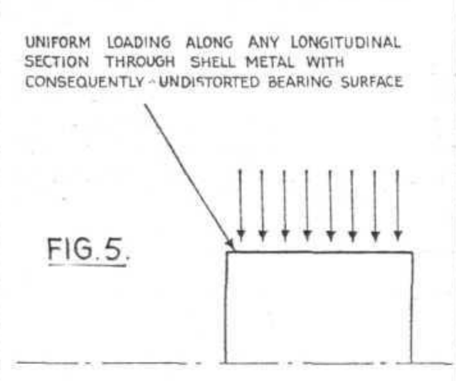


FIG.5.

The author is of the opinion that many of the failures of big end bearings which occur from time to time, particularly in diesel engines, are due to the hammering of the bearing immediately under the web, and the inability of the shell metal to "wrap" itself round the journal because of the restricting action of the web. Thus an unequal distribution of load in the shell gives rise to an unequal stress and so an unequal deflection, which in turn means an unequal load on the journal, with dire results, especially at high peak loads.

At first sight it appears logical to apply the same treatment to the small end, but conditions are less severe, and the smaller overall dimensions make it awkward to deal with. However, if a substantial diameter is employed for the gudgeon pin the scheme may be used in certain cases with success.

It is possible that considerable trouble may be met in practice through the development of fatigue stress at the radii "B" "B" (Fig. 6). Experiment would, no doubt, overcome this trouble, and it is not impossible to visualise a pin joint introduced at "B" "B" (see also Fig. 7) the pin being in multiple shear after the style of that used by Birkgit in the Hispano-Suiza engines.

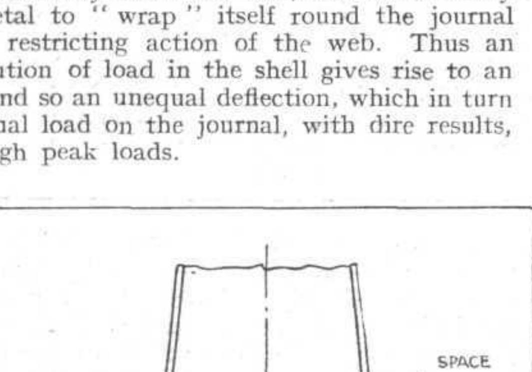


FIG.6

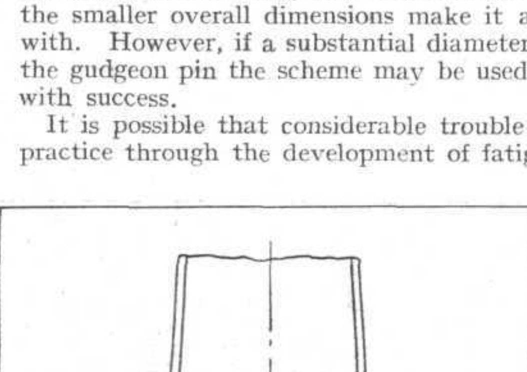


FIG.7

It will be evident that the same principle is applicable to the cap half of the bearing, the inertia loads being equally distributed along the edges of the shell and so "wrapping" the bearing round the journal with uniform pressure. In present-day practice these conditions are much more nearly obtained than in the main half of the bearing because of the freedom from stiffening members; and it is significant that by far the greater number of failures occur in the main half of the bearing in spite of the fact that the inertia loads may often exceed the gas loads.

Reference to Fig. 2 will show that to obtain the maximum possible advantage the amount of stiffening given to the joint edges of the shells by bolt bosses, etc., should be a minimum consistent with safety. Otherwise, the arc of flexible shell metal may be seriously reduced.

The Paris Aero Show

In the November 29 issue of *The Aircraft Engineer* will be published an article by Mr. M. Langley, A.M.I.N.A., A.M.I.Ae,E., dealing with the subject of progress in metal construction of aircraft as exemplified by the machines exhibited at the forthcoming Paris Aero Show. Mr. Langley is an instructor in design at the de Havilland Technical School, and author of the book "Metal Aircraft Construction." He is thus thoroughly familiar with the subject, and will give readers of *Flight* the benefit of his views.

THE EMPIRE AIR ROUTES

Need for a general speeding up : £. s. d. the Problem : A Review of past Policy

***On all hands** there is general clamour for a speeding up of the Empire Air Routes. The demand can **be satisfied** if the necessary funds are forthcoming. In the following notes the subject is examined in the light of the Australian Race Results and some of the problems are brought to light*

FROM the panic in the Press one would almost think that Great Britain had lost instead of won the great race to Australia. The writers seem to regard it as a national disgrace that two American commercial passenger aeroplanes should have won second and third places in the speed race, being beaten only by a specially designed British racer. They clamour for greater speed on British Empire air lines. That demand can be granted, provided that the taxpayers are willing to provide a larger amount of money by way of subsidy or mail contracts. It is only a matter of *£. s. d.*

A somewhat hysterical outburst in the Press cannot be taken as sure proof of the will of the people. If the Government decides that the time has come to spend more public money on expediting our air services to Australia and South Africa, no one will be more delighted than *Flight*. It must not, however, be hastily concluded that a decision to alter our air policy now proves that our policy in the past has been all wrong. It is always wise for those who would legislate for the future to examine the history of the past. Let us therefore remind our readers briefly of the history of British air subsidies.

Looking at the Past

Our present commercial air policy dates from the first régime of Sir Samuel Hoare as Secretary of State for Air. No sooner was he in office than he instituted the Hambling Committee to examine the situation and advise on a policy. There were at that time three companies running landplanes to the continent and one running seaplanes to the Channel Isles. This diffusion of British effort was not producing the best results, and the Hambling Committee advised a mobilisation. Hence there came into being Imperial Airways, Ltd., to which was granted a monopoly of subsidies so far as Europe was concerned, with a very distinct understanding that the same company should work up to Empire air services.

Monopolies have been much abused as unhealthy things; so have subsidies. As permanent institutions they would undoubtedly be very unhealthy. But British air transport was then a very sickly infant, and at times sickly infants have to be coaxed into health on brandy. So brandy was metaphorically poured into the feeding bottle of Imperial Airways. At the same time it was made very clear that as the child grew in vigour, so the doses would be diminished until they ceased altogether. It was, perhaps, an unorthodox prescription, made necessary by the desperate nature of the case. It did, none the less, produce the desired result. Looking back on it, we cannot imagine any course of treatment which would have done better.

This agreement laid down a very definite policy for Imperial Airways. Its directors were obliged always to work so that the company should become self-supporting by the time the subsidies should cease. They had to make their service attractive to the public, but always with the idea of making revenue exceed outlay at the earliest possible moment. The attractions offered could never be so costly as to jeopardise the attainment of that goal. Improvement in all directions (e.g., speed and comfort) had to be steadily continuous but never extravagant. When an air transport company has no real rival (and in the early, uncertain days it was a blessing that there was no rival) its wisest policy may be summed up in the maxim "fly as slowly as you can (economically) provided that the public finds that speed attractive; charge as high as the public is willing to pay for that speed." The ordinary course of operation has year by year varied the figures implied by that maxim, but any expenditure which violated its principles would have been against the policy which the Government had laid down for the company. In adhering to that policy, the directors of Imperial Airways have been neither knaves nor fools.

Changed Circumstances

Two circumstances only could change the policy which Imperial Airways have been obliged to follow. One is outside competition, and the other is a further dose of the stimulant which is so often condemned—public money. Competition, at least as far as the East Indies, has been provided by the K.L.M., and to some extent by the French line to Indo-China. The MacRobertson race has been a great demonstration of the Dutch challenge. The consequent clamour in the Press may bring about the other condition, namely a further dose of public money.

Unless more money is spent on our air service to India and beyond, there seems a distinct probability that the K.L.M. will attract to itself the majority of the passenger traffic, British or foreign. The fine performance of the Douglas machine in this race has been a magnificent advertisement for the K.L.M., and it has awakened the British public to the fear that Great Britain may be left behind in the air. The public, or at least powerful sections of the Press, is calling the tune. The public must therefore be prepared to pay the piper. We may take it that the time has now come for laying down a new policy, and we may look forward to the future without any shame in the past.

Considering the Future

What the Douglas has done is to show the possibility of combining comfort with speed. Imperial Airways has hitherto concentrated on comfort. It must, none the less, be remembered that the Douglas could not have done all that it did do in the race if it had flown only in daylight. The travelling public in general will not consent to fly night and day for 90 hours or so. One night of sitting more or less upright in a train is enough for most people. Some companies have provided sleeping berths in their aeroplanes, which reduces the passenger capacity by 50 per cent. Such a loss of pay load implies a still larger subsidy. For day and night travel by air as a practical proposition one must look to the *Graf Zeppelin* and her successors. Therefore we must be careful not to exaggerate the lessons taught us by the Douglas and the Boeing in this race.

Mails, however, can be flown on through day and night, with suitable reliefs of pilots and with proper organisation of the route. The K.L.M. and Imperial Airways are alike in opposing the idea of employing separate aeroplanes for mails and passengers. Here again we seem to be at the

beginning of things. Nobody is flying mails separately in special fast mailplanes, and so there is no rival to the combination aeroplane. It is safe to prophesy that history will repeat itself, and that once one of the rivals has started a special mail service, the other will be obliged to follow suit.

Tied up with this question is the other question of whether mail contracts or subsidies are the best form which public assistance can take. We do not dispute the contention that subsidies, when avoidable, are unhealthy things. It is only when they are inevitable that we approve of them. The mail contract, on the lines of the contracts given to shipping companies, has always seemed to us the best form of help because it is given for services rendered. In February last, Major Woods Humphery, general manager of Imperial Airways, wrote in *The Times*: "No 'mails only' service has as yet paid its way on the air mail surcharges, and no 'mails only' service has ever received subsidy at as low a rate on a comparable basis as has been possible for combined passenger and mail services." Since those words were published, the Tata Air Line Karachi-Bombay-Madras has begun to show a profit, and it is unsubsidised. It is a small concern, compared with Imperial Airways, but straws show which way the wind is blowing.

A mail contract, we conceive, should be a very profitable affair to the contractor. It should also be very rigorous in its terms, with heavy penalty clauses for delay. The K.L.M. does very well out of its arrangement with the Holland Post Office. It seems to us that the best policy which the British Government could now adopt is to offer a mail contract on the basis of flying day and night. The Air Ministry has already shown that its mind has turned in that direction, for it has already once ordered a special mailplane to be built. In the "Comet" we have the makings of a small fast mailplane ready to hand. Two services a week is not an impossible ideal for a start.

It has been calculated by Major Woods Humphery, in the article quoted above, that the weekly outward first-class mail from this country to Africa, India, and Australia is about 2½ tons, while the same inward mail is only 1½ tons. This creates a difficulty. Still, we hold that the Post Offices of the Empire should face this difficulty for the sake of the common good, and should offer terms which would satisfy the contractor. Such a contract is far easier to defend than is a direct subsidy. The greater facilities are likely to increase the amount of correspondence in both directions.

A Subsidy for Passengers?

Such a step would separate passengers from mails very definitely. The passenger machines would then require a subsidy, and, if the speed is to be increased in accordance with the demands now ringing in the Press, the subsidy would have to be greater than it is at present. This idea is not very attractive, but if the demand exists it will have to be met.

One thing the Australia Race *has* shown: The technical difficulties are the least insuperable, although it would be a serious mistake to argue that because Australia has been reached in three days, a *regular* air service could be operated to a similar schedule. A network of ground equipment will be necessary before that is a feasible proposition, and unfortunately Great Britain is not her own master in these things. The routes to Australia and South Africa, particularly the former, lies over countries the consent and co-operation of which have first to be obtained. And it is not as easy as might be imagined to persuade other nations that it would be in their interests to provide ground organisation for a British air route. That problem is political rather than technical. It is the fashion in many quarters to hold up the United States as an example of what air routes can be. We yield to no one in our admiration for the American network of air routes, but the United States are in a very different position in that they, and they alone, have the power to draft and enforce regulations. They pay the piper and they call the tune.

Technical Considerations

That America has produced, in the Douglas D.C.2, an aeroplane of exceptional merits no one would dream of denying. British designers who visited Mildenhall were loud in their praises of the clean aerodynamic design, and the remarkably fine workmanship. It is, however, worth remembering that when the Douglas company got the contract for building these machines, a batch of sixty was ordered straightaway. British aircraft constructors have mostly had to be satisfied with orders for two's and three's. That inevitably means that there is no income out of which experiment can be paid. There is no knowing how much the Douglas company expended on experiment, on jigs and on tooling. It must have been a very large sum indeed, and far beyond what any British constructor could have undertaken unless he were prepared to head straight for Carey Street.

Comparisons between the "Comet" and the Douglas have been freely made during the last week, although the two machines were designed for such totally different purposes that they are not comparable. The one was designed for very fast passenger transport, and achieves that aim in a very admirable manner; the other was designed to win the Australia race, and did so handsomely. Each represents a high-water mark in its own class. But to blame the "Comet" for not being a "flying hotel," as some sections of the Press have virtually done, is merely ridiculous.

Efficiency

If it comes to a question of sheer efficiency, the "Comet" is probably ahead of the Douglas. With engines totalling but 460 h.p. it carries two people and fuel for about 3,000 miles non-stop, and that at a speed of 230 m.p.h. The Douglas in the race carried seven people, and its range was in the neighbourhood of 1,000 miles. It has a top speed of about 210 m.p.h. for a power expenditure of approximately 1,400 b.h.p. It was fully equipped for carrying eleven more passengers, it is true, but it did not carry them, although we believe it did carry a very substantial mail load.

To get a better idea of what the "Comet" would do if converted, as it easily could be, into a "useful" machine, let us assume that it is to be used as a mailplane. By fitting smaller fuel tanks, which would reduce the range to about 1,000 miles instead of the 3,000 miles or so, space would become available for mails, and the mail load which could be carried would be 1,200lb. approximately. This would still enable two pilots to be carried, and also wireless equipment. It is estimated that the "Comet" with this load would cruise at more than 220 m.p.h. It is readily seen that such a mailplane would be a very efficient one, and that it might have its applications on a good many routes.

Incidentally, the structural efficiency of the "Comet" appears to be as high as the aerodynamic. For a tare weight of 3,033lb., the maximum permissible gross weight is 5,550lb., giving a ratio of gross to tare weight of 1.83. This is well above the average figure, and means that the machine carries as disposable load 83 per cent. of its own weight. In view of the fact that the machine is a cantilever monoplane, and one with a very thin wing at that, giving low profile drag, this figure must be regarded as truly remarkable. In this connection it may be pointed out that the Douglas D.C.2 has a gross weight of 18,080lb. and a tare weight of 12,200lb. This gives a ratio of gross to tare weight of 1.48 only. In other words, the Douglas carries but 48 per cent. of its own weight as disposable load. In fairness it should be pointed out that the tare weight includes very elaborate cabin furnishings, and a remarkably complete outfit of navigational and other

instruments, a fact which must obviously be taken into account when comparing the machine with one having more primitive equipment.

Much has been made of the fact that British commercial aeroplanes cruise at something like one-half the cruising speed of the Douglas. While we should be the last to claim that the American machine is not more efficient aerodynamically than the majority of large British commercial types, sight should not be lost of the fact that for approximately fifty per cent. more engine power, the British machines carry 36-38 passengers instead of 14. That is a point which many of those who have recently rushed into print with slashing criticisms of British civil aviation would do well to remember.

WHAT WE LEARN from the AUSTRALIA RACE

Views of Leading Authorities

With the MacRobertson Race results fresh in the minds of everyone, the following reflections upon the event by experienced constructors and operators will be perused with interest

"IMPERIAL'S POLICY VINDICATED."

By G. E. Woods Humphery, General Manager of Imperial Airways, Ltd.

THE attitude we take in the matter of our services is that we are transport contractors who are prepared to provide whatever services, at whatever speeds or capacities, are required by our clients. The people who pay for our services can be divided into three categories, (a) the Air Ministry who pay the subsidies, (b) the Post Office who pay us for the transport of mails, and (c) the passengers who pay the fares. The first two can really be bracketed together, because they work in consultation.

If, therefore, the Government wishes to institute a separate service for mails only on our Empire routes, they have only got to tell us to do it and it will be done.

Personally, my view is that the result of the Australia race is a complete vindication of our policy of mixing the mails and passengers together, so that both can get the greatest all-round advantages, and not that one shall get an advantage at the expense of the other.

"BRITISH CONSTRUCTORS CAN MEET THE DEMAND."

By H. O. Short, Managing Director of Short Brothers, Ltd.

IF commercial air line operators call for aircraft in which the primary objective is a very high cruising speed, and other desires are made of secondary importance, the demand can be met by British aircraft constructors without any difficulty. There has been no such demand from aircraft operators in this country, at least, from those companies who have had the most experience in operating air lines.

Pay load, comfort, and spacious cabins have been given first place, especially a large pay load, because it enables fares and charges to be reduced. Statistics apparently show that in general travellers by air will not pay much more for rapid transport than for slow transport. Hence we see internal British air lines trying to compete with railway fares and even bus fares. With what results is shown by balance sheets.

In other countries the public are apparently willing or forced to pay a large part of the cost for those who travel or send letters by airways. In this country to a lesser extent.

If we are to believe published figures, the Government of the U.S.A. spends nearly as much annually by way of subsidies to air lines as suffices to pay for the new aircraft and engines purchased each year by the British Government for the equipment of the Royal Air Force.

It is good for the American aircraft constructors and operators. We have been advised to move our factories farther from the continent of Europe. Why not move to the other side of the Atlantic!

"GROUND ORGANISATION MUST BE TACKLED."

By F. Handley Page, Managing Director of Handley Page, Ltd.

THE Mildenhall-Melbourne Race has provided most interesting results which, however, must be analysed very carefully if we are to see the real lessons to be learnt and how they can be applied to regular commercial flying.

It is almost a platitude to say that the first essential for commercial flying is regularity, and, therefore, there is a vast difference between the result that can be obtained by aircraft specially tuned up with engines taking a relatively large proportion of their maximum power and with super-pilots in command, and what can be done day in and day out on a regular service.

One of the most important items in regular service is the length of time that engines will run without overhaul, and the longer this can be safely extended the more efficient and economical will be the service. It is obviously uneconomical to run at high powers over short periods only and have repair or overhaul stations strung out over a long air route.

A lower rating of the engine and a longer period between overhauls means a heavier weight of power unit per cruising horsepower, but with such lower rating comes greater reliability and a higher percentage of that essential feature, regularity. The question, therefore, is what improvements in design are needed in the engine to permit the raising of the percentage of cruising horsepower to total horsepower?

The next point to which the Mildenhall-Melbourne Race has drawn marked attention is the great increase in average speed and diminution of elapsed time that results from flying continuously by day and night.

Would a service on similar lines be possible under all conditions of weather? Is the ground organisation adequate? Are the lighting and wireless beacons up to the same standard of ground organisation as those under which the regular transcontinental American routes are operated?

If not, how can similar results be hoped for in the way of speed and regularity, and how can full advantage of fast machines be taken if the ground organisation is not there? It may be urged that this is a difficult problem, because of the many nationalities involved, but it is the one essentially international subject to be tackled, and attention had far better be given to this broad problem than to attempts to equal internationally technical differences in regard to details of airworthiness certificates.

Speed Range Needed

The next lesson to be learnt from the Race is that if a service is to be run with regularity under all conditions, high speed must not be obtained at the sacrifice of slow speed and stability, otherwise there will be a crop of accidents on landing, particularly if landings have to be made under conditions of bad visibility. In this connection the results of the Rundflug are most illuminating, the R.W.D. 9 having a top speed of 255 km. (158.5 m.p.h.) and a slow speed of 54 km. (33.6 m.p.h.), a proportion of no less than 5 : 1.

If the confidence of the public is to be maintained it is most important that aircraft should under all conditions be landed safely, and this problem becomes much easier if the landing speed is low and the alighting gliding angle fairly steep.

Finally, when a race has been run and an extraordinary demonstration given of engineering skill and pilots' stamina in navigation, it does not mean that similar speeds should be aimed for as essential in commercial aviation. The faster you fly, beyond a certain limit, the smaller must be the payload and the more costly the service. The speed of the service should be in relation to other competing means of transport and to the needs of the centres between which the service is run. It is much more economical to spend money on good ground organisation which is available on a working route for all time, and to run services through day and night and so save time, rather than to push up the speed of aircraft unduly and endeavour to make up in the air what is lacking on the ground.

"IT IS SPEED WHICH IS NOW REQUIRED."

By P. D. Acland, London Representative of the Westland Aircraft Works and late Chairman of the S.B.A.C. and the Aviation Section of the London Chamber of Commerce.

ON all sides the question is being asked, "What are the lessons which the great flights to Australia of the last few days will teach us?" In aeronautical circles, of course, immediate and simple solutions are found to all such problems! But there are a number of obstacles to be negotiated before much can be done. We have all felt a keen sense of disappointment as each Budget Day goes by and but little mention is made of the practical steps for the expansion of our great Imperial airways. To those of us who had the privilege of being concerned, in even the humblest capacity, with the great flights of fifteen years ago, the bright vistas opening in front of us, instead of coming nearer, have seemed almost to have become dim. The famous dictum that "civil aviation must fly by itself" has become the corner-stone of our policy, and has appeared to be the foundation of any steps taken for the furtherance of air transport. All who read *Flight* are familiar with the progress of aviation, both military and civil. Each one is probably interested in some particular aspect or phase. There is thus no need to enter into a discussion of the details of past history, except that, in answering our question, it is impossible not to point to one or two principal events in an endeavour to offer suggestions as to certain directions in which advantage may be taken of, what is, to put it bluntly, a serious setback to British aviation, paradoxically made evident to the nation at a moment of one of our greatest triumphs.

Foreign Performance

Two practically standard large air liners of foreign design and construction have just put up a performance but little inferior to that of the "Comet," a machine which can only be described as a miracle of achievement. This performance is one which shows that there is no reason whatsoever, technically, why the proposed time schedules for the England-Australia service should not be halved. We are told that increased speed is merely a question of cost. For the last three or four years the commercial community has been urging, through the Press, in the House of Commons, in the Lords, and the appropriate Departments of State, for fast, frequent air mail services. British Chambers of Commerce abroad have asked that our British services shall be at least as fast as those of our competitors. On several occasions the definite request has been made to the Government that, in view of the increasing technical competition, it is speed which is now required. Consequently, the whole of the policy of Civil Air Transport Subsidy should be reviewed, and British aviation be put at last into its rightful position of leading the world, not only in safety and efficiency, but, above all, in "service to be rendered." Business generally is aware that this will cost money, but, provided the business community is treated openly and frankly, and given all the facts, surely there is no reason to suppose that it will do otherwise than to welcome "service" in the same spirit as was exhibited in assisting the building of the *Queen Mary*.

Speed

Great Britain is rapidly becoming air-minded, and is demanding that in the air, as in other means of transport, she must, and shall, be at least in the front rank. The lessons of the MacRobertson Trophy appear to be, therefore, that speed, the thing we have to sell, is proved; that included in any terms of subsidy this fact must now be recognised; that in the future there must be collaboration between all the interests concerned—Government, users, operator, and the industry—so that never again shall we be placed in the unenviable but avoidable predicament we are in to-day. The industry, without which air transport cannot exist, will then be able to get down to business at last. This will take time, and no doubt in the interregnum special steps will have to be taken, but this must not be allowed to colour in any way the decisions with regard to the future. We must start with a clean sheet, looking forward, not backward, never forgetting that Aviation is Progress.

Aircraft Works at South Shields

A scheme for the encouragement of aircraft manufacturers to establish works in South Shields was approved at a meeting of the Town Council last month. A special committee, consisting of the Mayor and six other members of the Council, is to be set up to consider and report upon the ways and means of achieving this object, and, in addition, to arrange for a course of lectures in the science of aeronautics in the curriculum of the Marine School.

Johnston Memorial Prize

Names of suitable candidates for this prize are now being considered. The prize is awarded for the best feat of navigation during the twelve months ending June 30 by a person in a civil capacity and of British nationality. Any candidates wishing to submit their names and particulars of their claims to the Guild of Air Pilots and Air Navigators of the British Empire, 61, Cheapside, London, E.C.2, are asked to do so not later than Tuesday, November 13.

THE ROYAL AIR FORCE

Service Notes and News — Air Ministry Announcements

MOVE OF No. 33 (BOMBER) SQUADRON

No. 33 (Bomber) Squadron will move from Bicester to Upper Heyford. The move is to be completed by November 27, 1934.

MOVE OF No. 101 (BOMBER) SQUADRON

No. 101 (Bomber) Squadron will move from Andover to Bicester. The move is to be completed by December 4, 1934. The squadron will come under the command of the A.O.C., Central Area, with effect from that date.

No. 447 (F.S.R.) FLIGHT

No. 447 (Fleet Spotter Reconnaissance) Flight, which provides catapult seaplanes for the First Battle Squadron and the First Cruiser Squadron, is being re-equipped with "Ospreys" in place of Fairey 3Fs. H.M.S. *Sussex*, which took H.R.H. the Duke of Gloucester to Australia, took an "Osprey" on board before sailing, and the other ships of the First Cruiser Squadron will soon embark "Ospreys."

Nos. 824 and 825 (FLEET SPOTTER RECONNAISSANCE) SQUADRONS

No. 824 (F.S.R.) Squadron, at present located in H.M.S. *Eagle*, was renumbered No. 825 (F.S.R.) Squadron, with effect from October 8, 1934.

On the same date No. 824 (F.S.R.) Squadron was re-formed at the R.A.F. Station, Upavon, preparatory to embarkation in H.M.S. *Hermes*, for service on the China station.

THE ROYAL AIR FORCE BENEVOLENT FUND

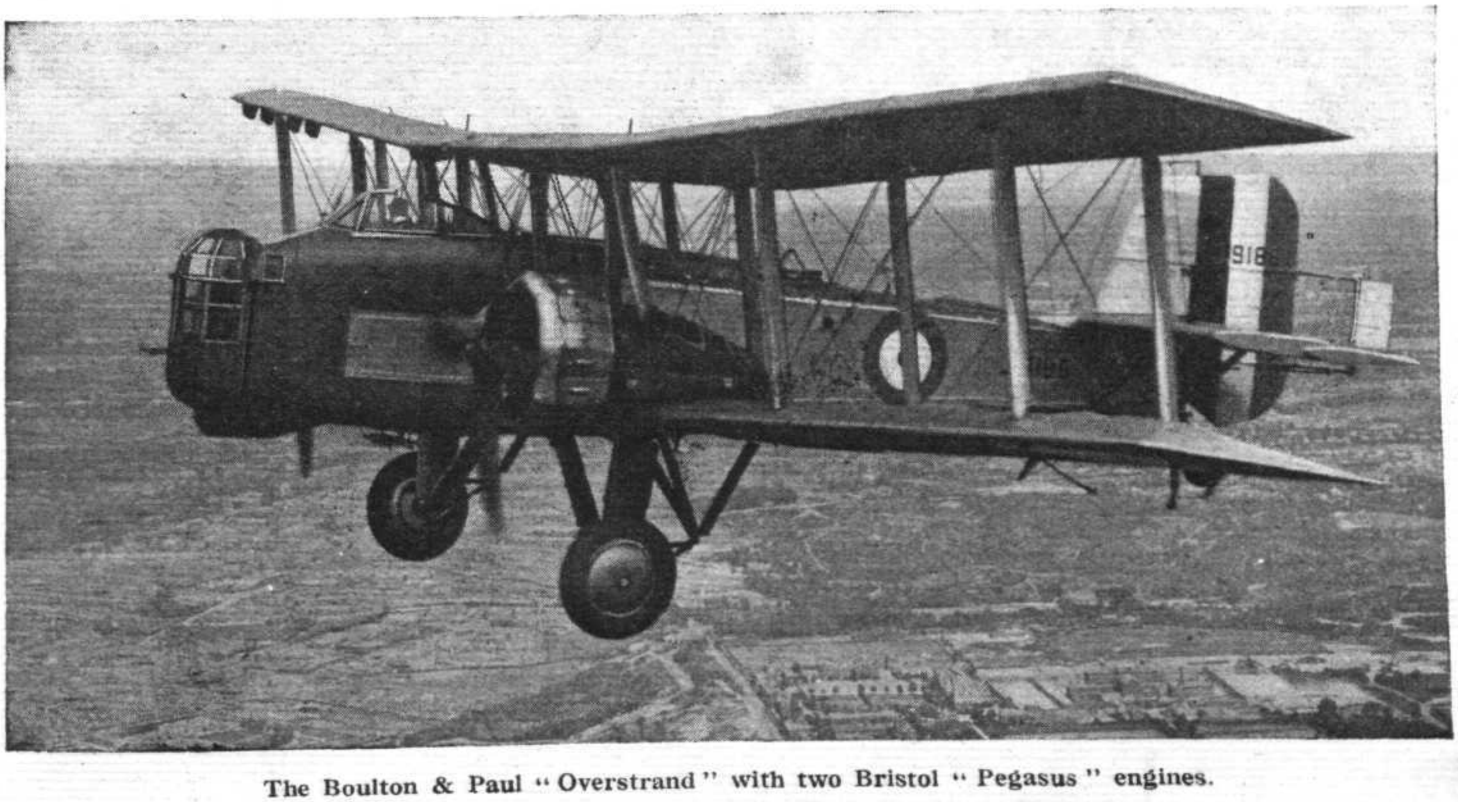
The usual meeting of the Grants Committee was held at Iddesleigh House on Thursday, October 18, 1934. Mr. W. S. Field was in the chair, and the other members of the Committee present were Air Commodore B. C. H. Drew, C.M.G., C.B.E., and Mrs. L. M. K. Pratt Barlow, O.B.E. The Committee considered a number of cases and made grants to the amount of £669 8s. 2d. The next meeting was fixed for Thursday, November 1, 1934, at the offices of the Fund.

H.M.S. *ENGADINE* REUNION

The Sixteenth Annual Reunion of the Ship's Company of H.M.S. *Engadine* will be held on Saturday, November 10, at the Adelphi Hotel, John Street, Strand, W.C.2, at 6.30 p.m. Further particulars to be obtained from Arthur B. Ward, 19, Cursitor Street, Chancery Lane, London, E.C.4.

THE "OVERSTRAND"

It has for some time been an open secret that the Air Ministry has decided to place an order for a substantial number of Boulton and Paul "Overstrand" day bombers, and this fact may now be openly stated. The "Overstrand" was shown to the public at the R.A.F. Display at Hendon last June, and attracted much attention. It is a development of the "Sidestrand" with which No. 101 (Bomber) Squadron has been equipped for some years past. Having two engines out on the wings, very little vibration is felt in the fuselage of the "Sidestrand," and therefore No. 101 B.S. set up a great reputation for the accuracy of its bomb-aiming and its aerial gunnery. The same good qualities will be found in the "Overstrand," which has two Bristol "Pegasus" engines out on the wings. The special feature of the new type, which makes it unique among the machines adopted by the R.A.F., is the gun turret in the nose of the machine, which, it is stated, eliminates the difficulties with which air gunners have had to contend in the past. The gunner is protected from the rush of air, and, moreover, works his gun from a sitting position. No physical exertion is demanded from him, even when flying at great heights. All that he has to do is to point the gun in any desired direction, and the turret mechanism does the rest. The turret can be rotated fast enough to allow the gunner to swing on to a hostile aeroplane moving at high speed across his front. The "Overstrand" is capable of high speed and a rapid rate of climb to more than 20,000 feet, and has also a long endurance, such as will enable it to be used when desired as a night bomber.



The Boulton & Paul "Overstrand" with two Bristol "Pegasus" engines.

AN ANGLO-DUTCH OCCASION

When the new aerodrome at Brastagi (Sumatra) was opened recently some aeroplanes from the R.A.F. Base at Singapore flew over to attend the ceremony. Cordial speeches were exchanged, and the Governor said that the presence of the British was due to a conversation he had had with Sir C. Clementi, lately Governor of the Straits Settlements. The British airmen expressed the hope that before long some Dutch officers and men would be able to come to Singapore to return the visit.

NOMENCLATURE OF AIRCRAFT "HENDON"

The official name of The Fairey Aviation Co., Ltd., night bomber aeroplane with two Kestrel engines is "Hendon." This name is to be used in all correspondence and reports relating to this type of aeroplane.

NIGHT FLYING WITHOUT NAVIGATION LIGHTS

Night flying without navigation lights will be carried out by aircraft within the area bounded by latitudes 50° 20′ N. and 50° 40′ N., longitudes 1° 1′ W. and 1° 34′ W. from November 1 to November 3, 1934, inclusive, between 18.00 and 21.00 hours. Aircraft will not exhibit navigation lights at altitudes up to 4,000 ft. unless other aircraft are observed in the vicinity.

AIR COUNCIL LUNCHEON

The Marquess of Londonderry, Secretary of State for Air, presided at a luncheon given by the Air Council at the Savoy Hotel on October 24 to the Air Attachés and other members of the Diplomatic Corps concerned with aeronautics. The following accepted invitations to be present:—General A. Nyssens (Belgium); Captain N. Arnaud (Brazil), Dr. Wei-Cheng Chen and Commander Yeo-Chu Tsen (China), Monsieur H. Markus (Estonia), Col. L. F. Geyr von Schweppenburg (Germany), Major Z. de Algya-Pap (Hungary), Major K. Shukri (Iraq), Captain E. Trigona della Foresta (Italy), Captain A. Oka (Japan), Col. Maruyama (Japan), Monsieur J. Kajeckas (Lithuania), Major J. H. Perez (Mexico), Monsieur R. Andvord (Norway), Captain K. Bayendor (Persia), Senor Don Carlos R. Mackehenie (Peru), Count R. Michalowski (Poland), Colonel J. Lucas (Portugal), Commander Don J. Legorburu (Spain), Commander E. D. Toren (Sweden), Monsieur W. A. de Bourg (Switzerland), Commander L. C. Stevens (United States), Senor Dr. Don R. MacEachen (Uruguay). There were also present:—Air Chief Marshal Sir Edward L. Ellington (Chief of the Air Staff), Air Vice-Marshal F. W. Bowhill (Air Member of Council for Personnel), Air Marshal Sir Hugh C. T. Dowding (Air Member of Council for Supply and Research), Sir Christopher Ll. Bullock (Permanent Secretary of the Air Ministry), J. S. Ross, Esq., C. R. Brigstocke, Esq., Air Marshal Sir Edgar R. Ludlow-Hewitt, Air Commodore C. L. Courtney, Air Commodore A. W. Tedder, Lieut.-Col. F. C. Shelmerdine, Group Captain R. H. Peck, Squadron Leader A. R. Boyle, and C. J. Galpin, Esq.

R.A.F. FLYING ACCIDENT

The Air Ministry regrets to announce that Acting P/O. Eric Godwin Hall lost his life as the result of an accident which occurred at Hawarden, Flintshire, on October 26, 1934, to an "Atlas" aircraft of No. 5 Flying Training School, Sealand. Acting P/O. Hall was the pilot and sole occupant of the aircraft.

ROYAL AIR FORCE GAZETTE

London Gazette, October 23, 1934

ROYAL AIR FORCE

General Duties Branch

Capt. I. O'B. MacGregor (Royal Artillery) is granted a temporary commission as Flying Officer (Hon. Flt. Lt.) on being re-seconded for duty with the R.A.F. (Oct. 1); Lt. C. C. Musselwhite (Middlesex Regt.) is granted a temporary commission as Flying Officer on being re-seconded for duty with the R.A.F. (Oct. 1); Lt. I. C. Rowe, R.N., is re-attached to the R.A.F. as a Flying Officer, with effect Oct. 3, and with seny. of Sept. 30, 1928.

The follg. Flying Officers are promoted to the rank of Flight Lieutenant:—G. B. Keily, J. D. Baker-Carr, C. R. Lousada (Sept. 15); H. St. G. Burke (Sept. 27); R. P. Cauthery, G. F. Alexander, F. A. Wardell, W. N. H. Banks (Oct. 2); M. Watson, N. C. Singer (Oct. 13).

The follg. Pilot Officers are promoted to the rank of Flying Officer:—R. A. C. Barclay (June 17); N. Hope (Oct. 1); E. S. Butler (Oct. 10).

F/O. E. C. Ingham takes rank and precedence as if his appointment as Flying Officer bore date Sept. 12. Reduction takes effect from Sept. 12; Flt. Lt. J. W. Homer is placed on the half-pay list, scale B, from Oct. 11 to 22 inclusive; Flt. Lt. H. A. G. Comerford is transferred to the Reserve, class A (Oct. 17); P/O. D. Prowse resigns his permanent commission (Oct. 11). The short service commission of Acting Pilot Officer on probation D. B. Harrison is terminated on cessation of duty (Oct. 7).

ROYAL AIR FORCE RESERVE

Reserve of Air Force Officers

General Duties Branch

The follg. Flying Officers are transferred from class C to class A:—R. J. T. Barrett (Aug. 28); R. Mountain (Sept. 7).

Flt. Lt. H. B. Collins is transferred from class A to class C (July 14, 1933).

The follg. Flying Officers relinquish their commissions on completion of service:—W. M. E. Crump (July 17); C. E. B. Winch (Sept. 7); A. W. Shaw (Sept. 12); F. G. Downing (Sept. 28).

F/O. J. L. Miles relinquishes his commission on completion of service and is permitted to retain his rank (Sept. 12); the commission of Pilot Officer on probation G. J. D. Dale is terminated on cessation of duty (Sept. 14); F/O. C. B. McNair resigns his commission (July 2).

SPECIAL RESERVE

General Duties Branch

The follg. Pilot Officers on probation are confirmed in rank (Sept. 17):—B. G. Corry, M. J. C. Stanley.

AUXILIARY AIR FORCE

Accountant Branch

No. 607 (County of Durham) (Bomber) Squadron.—S. E. Sprot is granted a commission as Pilot Officer (Aug. 29).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Wing Commander.—R. D. Oxland, O.B.E., to D.O.I., Dept. of Chief of the Air Staff, Air Ministry, 15.10.34, vice Sqd. Ldr. A. C. Bayley.

Squadron Leaders.—E. L. Ardley, to Headquarters, Air Defence of Great Britain, Uxbridge, 21.10.34. For Personnel Staff duties vice Sqd. Ldr. O. W. de Putron. O. W. de Putron, to School of Army Co-operation, Old Sarum, 22.10.34. For flying duties in Training Squadron vice Sqd. Ldr. K. H. Riversdale-Elliot. F. Wright, to No. 43 (F) Squadron, Tangmere, 22.10.34. To Command vice Sqd. Ldr. R. H. Hanmer, M.C. C. R. Davidson, M.C., to No. 2 Flying Training School, Digby, 15.10.34. For flying (flying instructor) duties.

Flight Lieutenants.—G. M. Knocker, to Station Flight, Abingdon, 14.10.34. E. J. H. F. Moreton, to No. 25 (F) Squadron, Hawkinge, 15.10.34. D. C. Prance, to Marine Aircraft Experimental Establishment, Felixstowe, 8.10.34. I. A. Bertram, to Directorate of Organisation, Dept. of Chief of the Air Staff, Air Ministry, 22.10.34. M. C. Collins, to No. 204 (F.B.) Squadron, Mount Batten, 15.10.34. W. H. Markham, to Aeroplane and Armament Experimental Establishment, Martlesham Heath, 18.10.34. H. H. Leech, to No. 824 (F.S.R.) Squadron, Upavon, 8.10.34. J. G. W. Weston, to R.A.F. Station, Mildenhall, 16.10.34.

Flying Officers.—C. C. Musselwhite, to No. 4 Flying Training School, Abu Sueir, Egypt, 1.10.34. On appointment to a temporary commission. G. W. P. Grant, to R.A.F. Base, Gosport, 15.10.34. Hon. E. F. Ward, to R.A.F. Base, Gosport, 17.10.34.

Pilot Officers.—J. H. G. Sarll, to R.A.F. Base, Gosport, 12.10.34. P. S. Gomez, to R.A.F. Depot, Uxbridge, 17.10.34. K. Gray, to No. 824 (F.S.R.) Squadron, Upavon, 8.10.34. A. J. D. Harding, to No. 824 (F.S.R.) Squadron, Upavon, 8.10.34. C. T. Weir, to No. 824 (F.S.R.) Squadron, Upavon, 8.10.34.

Acting Pilot Officers.—C. L. Gomm, to No. 45 (B) Squadron, Helwan, Egypt, 1.10.34. R. G. Musson, to No. 216 (B.T.) Squadron, Heliopolis, Egypt, 1.10.34.

Stores Branch

Flight Lieutenant.—H. B. S. Ballantyne, to No. 99 (B) Squadron, Mildenhall, 16.10.34.

Flying Officer.—E. F. Smith, to No. 33 (B) Squadron, Bicester, 16.10.34.

Accountant Branch

Flight Lieutenant.—D. Sender, to No. 99 (B) Squadron, Mildenhall, 16.10.34.

Flying Officer.—N. Wallett, to Station Headquarters, Hal Far, 1.10.34.

Medical Branch

Squadron Leader.—J. B. Gregor, to Headquarters, R.A.F., Far East, Singapore, 16.10.34. For duty as Principal Medical Officer.

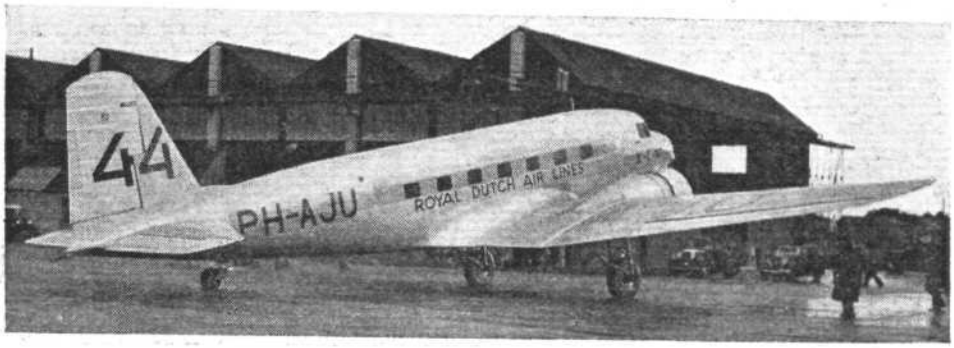
Flight Lieutenants.—C. W. Coffey, to R.A.F. Base, Gosport, 9.10.34. M. T. O'Reilly, to R.A.F. Station, Mildenhall, 16.10.34. L. S. Everett, to Station Headquarters, Heliopolis, Egypt, 27.9.34.

Flying Officer.—D. R. Crabb, to R.A.F. General Hospital, Palestine and Transjordan, 27.9.34.

Dental Branch

Flying Officer.—W. V. A. Denney, to R.A.F. General Hospital, Hinaidi, Iraq, 10.10.34.

COMMERCIAL AVIATION
— AIRLINES — AIRPORTS —



EFFICIENCY

Some Facts and Features of a Machine which has Been Shown to be Outstanding in its Class. Speed and Comfort Combined in America's Latest—the Douglas D.C.2.

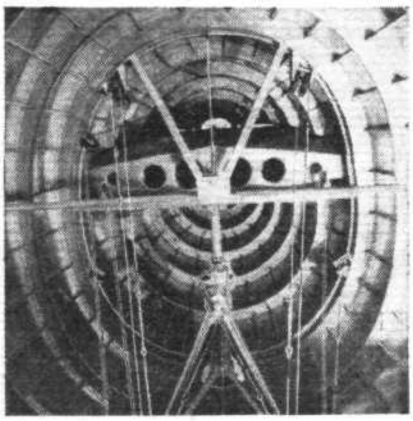
TO what can one attribute the exceptional performance of the Douglas D.C.2? This was a general question the other week at Mildenhall, where K.L.M.'s new machine proved such a magnet to everyone present, including some of our most capable aircraft designers.

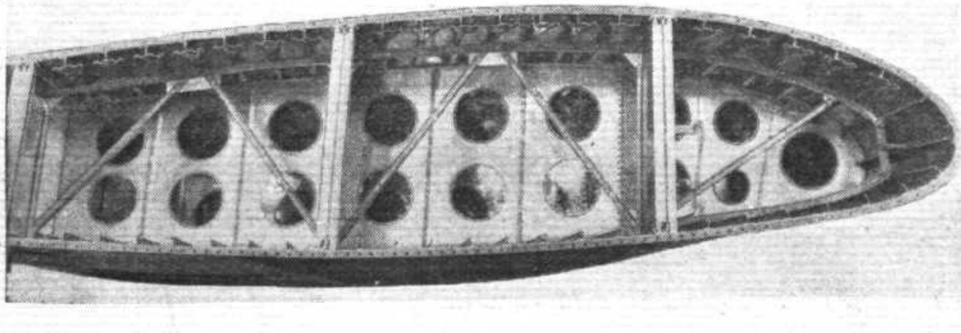
One might summarise and give two reasons. First, aerodynamic efficiency resulting from a clean structure and absence of interference between adjacent and adjoining members, and, secondly, the incorporation of ideas in accordance with modern American practice in commercial aircraft, as, for example, geared and supercharged engines—operating in low-drag cowlings, using fuel of high octane value and driving variable pitch airscrews—retractile undercarriages and trailing edge flaps.

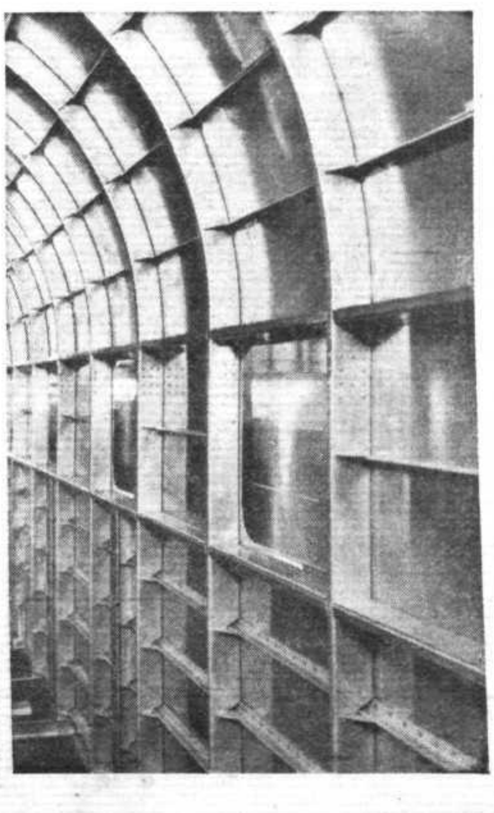
On examining the aircraft in detail, features are noticed which simplify both production and maintenance. The multi-cellular wing and the semi-monocoque fuselage are notable examples. Little, if any, comfort has been sacrificed to performance, and from the passengers' viewpoint the machine is one of the quietest in operation, and displays few uncomfortable characteristics such as are sometimes noticed in high-speed machines flying in rough weather.

When the prototype, the D.C.1, was built to T.W.A. specifications, few experts believed that the requirements would be met. Actually, they were exceeded by about 30 per cent.

Stressed skin multi-cellular construction is used for the cantilever wing, which tapers in both plan form and thickness. Great torsional rigidity is claimed. In this type of construction, which was developed by the Northrop Corporation, a subsidiary of the Douglas Aircraft Co., Inc., there is a large number of members taking the loads with no heavy concentrations. The skin varies in thickness from .02in. to .029in. and is reinforced by numerous longitudinals, riveted at intervals of about 4in., which resist bending, and by ribs. Actually, the skin covering is No. 24 SRT "Alclad," which may be regarded as a sandwich of duralumin between two sheets of aluminium. Three webs, with heavy flanges riveted to the skin, carry the vertical shear loads. Torsion is taken by the skin, and frequent ribs preserve the contour and divide the structure up into a number of small cells. The upper surface of the centre part of the wing is composed of heavy corrugated sheet under the flat covering, and the nacelles are riveted to this

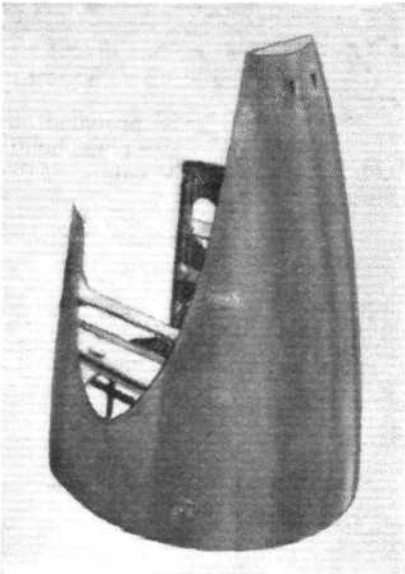


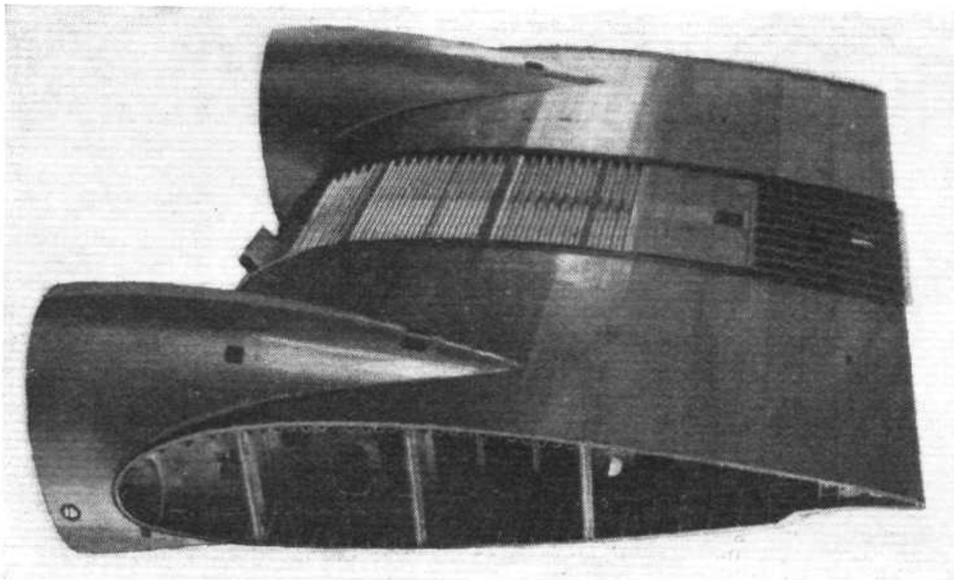




(Top left) The rear portion of the fuselage showing the semi-monocoque construction, (below) a portion of the "multi-cellular" wing, and (right) a part of the cabin structure.

Commercial Aviation





One of the nacelles, and (right) two of these units mounted on the centre section of the wing.

sheet, making an integral unit. Along the centre section of the wing between the two ailerons is a hydraulically operated split trailing edge flap which may be lowered in about one minute at an air speed of 80 m.p.h. All tail surfaces other than the rudder are of multi-cellular construction.

In the D.C.2 used by T.W.A. and K.L.M. Wright "Cyclone" F.3 geared and supercharged nine-cylinder radials, rated at 710 h.p. at 7,000 ft., are fitted. Alternatively, Pratt and Whitney "Hornets" of similar power may be used. The engine mountings are of welded steel tubes, the entire nacelle forward of the fire wall being quickly detachable. Both nacelles are interchangeable, and an engine may be changed in fifteen minutes. N.A.C.A. cowlings, made in three sections, and easily removed by one man, are fitted. Two main tanks, holding 150 gallons each, and two auxiliary tanks of 62 gallons capacity each, are located in the wing. The two main tanks are fitted with simultaneously opening dump valves.

When retracted the wheels of the undercarriage move forward and upward. A small portion of wheel is left protruding to allow an emergency landing.

Of semi-monocoque construction, the fuselage, like the wing, is covered with riveted skin. The entire interior is accessible from nose to tail. A hinged cover gives entrance to the nose compartment for inspection of the back of the instrument board and of the hydraulic brake cylinders. The floor of the passenger cabin is covered with a waterproof material and is removable for inspection and service of the control cables below. Movable shatterproof glass panels, which may be cleaned externally while in flight, are fitted to the pilots' cabin, which is rainproof and as near draughtproof as possible, and is designed to eliminate reflection and glare. Complete dual flying controls are installed. The controls for the trimming "tabs" are accessible to both pilots, each of whom has a brake operating lever at his disposal. If desired, the navigation instruments may be so placed that the hands will be horizontal at the cruising speed determined by the buyer. Electrical instruments are grouped on a separate panel in a shielding box.

Fourteen chairs are placed in two rows along each side of the cabin. Individual furnishings for each seat include reading lamp, ash tray, literature pocket, lunch tray, call button, ventilation control, and air sickness container. Dome lights provide general illumination. Hat racks are installed above the windows. The seats are 19in. wide, are adjustable to a reclining position, and are reversible, so that the passenger may sit facing aft if desired. The aisle between the seats is 16in. wide. Aft of the cabin is a buffet with ice box, refuse re-

DOUGLAS D.C.2

Two Wright "Cyclone" F.3 (710 h.p. at 1,950 r.p.m. at 7,000 ft.)

DIMENSIONS				
Span...	85 ft. (*25,9 m*)			
Length	62 ft. (*18,90 m*)			
Height	16 ft. (*5 m*)			
Wing area	940 sq. ft. (*87,5 m²*)			
Track	18 ft. (*5,5 m*)			
WEIGHTS				
Weight empty (with equipment)...	12,200 lb. (*5530 kg*)			
Disposable load	5,880 lb. (*2670 kg*)			
Gross Weight	18,080 lb. (*8200 kg*)			
LOADINGS				
Wing loading	19 lb./sq. ft. (*93 kg/m²*)			
Power loading	8.5 lb./h.p. (*3,85 kg/h.p*)			
PERFORMANCE				
Maximum speed at 7,000 ft.	210 m.p.h. (*338 km/hr*)			
Cruising speed at 62.5% power at 7,000 ft.	172 m.p.h. (*277 km/hr*)			
Landing speed with flap ...	61 m.p.h. (*98 km/hr*)			
Absolute ceiling	24,800 ft. (*7600 m*)			
Service ceiling	23,200 (*7100 m*)			
Service ceiling on one engine	6,000 (*1850 m*)			
RANGES WITH VARIOUS LOADS				
Range at 62.5% power at 7,000 ft. and 172 m.p.h. ...	625 miles	870 miles	1,000 miles	2,200 miles
Total payload...	3,747 lb.	3,064 lb.	2,689 lb.	2,317 lb.

The split trailing edge flaps, and the arrangement of the retractile undercarriage. Note the generous fillet at the junction of wing and fuselage.

ceptacle, and space for two half-gallon thermos flasks, and for fourteen lunch boxes. The lavatory is also located behind the cabin.

It is possible to maintain a temperature of at least 70 degrees F. in the cabin, the air temperature being controlled by a thermostat. Vents are provided for adequate ventilation. At cruising speed the passenger cabin has a sound level below 72 decibels, this result being attained by the complete sealing of the compartment, treatment of walls and floors with a combination of sound-absorbing materials acting for different noise frequencies, and the installation of a sound filter in the ventilation intake.

Two cargo and baggage compartments are provided, one being located in the plane of the engines and airscrews, holding 1,000 lb. of baggage, and the other behind the cabin. Aft of this latter is a door leading to the tail.

CROYDON

Is Speed Really Expensive? : Its Use on European Services : Combining Speed and Luxury : Croydon and Record Attempts : Imperial Airways' Popular Night Services : The Perfect "Robot"

NOW that the Australia race is almost over we begin to settle down again at Croydon. There was much admiration for the magnificent effort of Scott and Campbell Black here, but our professional interest was more keenly aroused by the performance of the Douglas commercial machine.

People are asking if speed is so terribly expensive as some experts would have us believe, and if the fact of doing twice as much work in an hour is not as important in the air as in a factory, for example. The truth probably lies in the fact that speed will pay on long distance, but not on short, routes.

Imperial Airways services to and from Paris are always crowded, so much so that it has been decided to continue the night service—starting at 6.30 p.m. from either end—through the winter. Luxury certainly pays on that line, but even in Europe there are lines between such places as London and Marseilles, Prague or Malmo where speed is essential.

Long-distance routes cannot be run with sufficient regularity of arrival with slow aircraft, and the stereotyped "machines delayed awaiting connections" is a message which must cease to come through. People make their appointments on the air company's schedule, and the fact that there was a strong head wind all the way from Scandinavia or Czechoslovakia does not compensate business people for arriving in London two hours late.

The punctual arrival of long-distance aeroplanes must be ensured, and that, in Europe, is one of the uses to which speed could be put.

Interest recently has been centred on types like the Douglas—fast fourteen-seaters, in which comfort rather than luxury is provided. The type likely to be needed in Europe is surely more that of the Fokker XXXVI, where every comfort is combined with a cruising speed of more than 170 m.p.h. I make no excuse for this digression, for I do but chronicle current airport thought and gossip.

The Air Ministry grows wiser. Some time ago the Mollisons were granted permission to take off from Croydon with an overloaded machine and one, moreover, overloaded with a highly inflammable load. They did not succeed in taking off, but that is another story. Croydon, the commercial airport, is no place for such events. Last week Col. Fitzmaurice wished to make full load tests with the *Irish Swoop*, and permission was refused. This was entirely sound and reasonable, and he went to Portsmouth to make his tests. Let us hope that certain foreign newspapers will not regard this as another injustice to Ireland. Anyway, I wish Col. Fitzmaurice the best of luck in his attempt on the Australia record, and so does everyone here at Croydon.

Reverting to the Imperial Airways' night services, I hear that there are numerous passengers who ring up and book return night flights if the weather forecast promises clear weather. The attraction, apart from a day in Paris, is the beauty of the night flights and the really excellent dinner served on board. It is a most impressive sight to see *Hengist* with cabin windows lit up and navigation lights on, some miles out in open country, as I did one starry night recently.

The second D.H. 86 for Quantas is at Croydon, and the departure for Australia was provisionally fixed for yesterday. Capt. A. R. Prendergast will fly the machine to Australia, accompanied by First Officer Creates. I hear the third of these machines is due for delivery next week, and that Capt. "Jimmy" Youell will take her to Australia, accompanied by Mr. Valette, of Marconi's. Jimmy Youell will be stationed at Singapore for about three months before returning to Croydon.

There was a very interesting display last week of the Siemens automatic pilot fitted to a Siemens-engined Junkers machine. The control is electric and the mechanism hydraulic. Everything has been thought of, and if the "robot" should cease to function for any reason a hooter sounds in the cockpit warning the pilot to take over.

This "robot" seems capable of doing most things a pilot can do. If it is set to take the machine up to 6,000 ft., for example, it does so and then flies level at that height. The machine left here on Tuesday evening for a demonstration in Amsterdam.

I am told that this company is experimenting with a device to warn aircraft in flight of the presence of other aeroplanes in the vicinity, an invention which becomes more and more necessary on our congested air routes. A. VIATOR.

Cardiff—Le Touquet—Paris?

Next year it is probable that Norman Edgar (Western Airways), Ltd., will operate a service between Cardiff, Le Touquet and Paris.

The Hundredth Year of Lloyd's Register

There were nearly five hundred guests at the dinner given at the Savoy Hotel last Thursday to celebrate the centenary of Lloyd's Register of Shipping. Sir George Higgins, C.B.E., was in the chair, and the toast list included many well-known names.

Lloyd's Register is, as Mr. Walter Runciman, M.P., remarked when he proposed its toast, a most amazing volume, in which are classified more ships than in those of all the other societies in the world. "In spite of recent events," he said, "there are still people who believe that it will be necessary occasionally to travel by sea. But if ships were disused I have no doubt that Lloyd's Register would then devote itself to standardising and classifying the horse-power, and possibly the pilots, of the world's flying services."

However, there are rumours that, as a direct result of the Gorell Report, Lloyd's will, in the near future, give up their aviation section, which would be more than a pity.

Spartan Air Lines

On Wednesday the services to Southampton and the Isle of Wight, operating in connection with the other Railway Air Services from the Midlands and North, were discontinued, but a modified daily service will be run by Spartan Air Lines until further notice.

Glasgow-Islay Service to be Reopened

Abandoned by Midland and Scottish Air Ferries, Ltd., after Mr. J. C. Sword had spent £40,000 on its development, the Glasgow-Campbeltown-Islay air service is to be reinaugurated next month by Northern Airways.

Mr. George Nicholson, who inaugurated the air service between Newcastle and the Isle of Man, opened negotiations in Glasgow on October 24.

Mr. Nicholson states that he is arranging a lease of Mr. Sword's landing grounds at Strathfield, Campbeltown, and at Duich, Islay. He intends to run a service on three days a week to Islay during the winter, which is to be available also for special charter work and air ambulance cases.

Mr. Sword is maintaining the air ambulance service for the present, and C. Almond, who has been standing by as pilot for this work, has been engaged to take over the new service.

Commercial Aviation

HESTON

A Saharan Flight : "Potting" Noises for the B.B.C. : Taxis and "Taxis" : A Rajah's "Commodore"

MESSRS. J. H. Wright and John Polando, the pilots of the Lambert monocoupé competing in the Australia race, were, as is known, arrested in Persia, where they made a forced landing. It is now learned that Airwork, Ltd., was responsible for their release. Capt. E. G. Cummings, the pilot in charge of an Airwork "Dragon" on charter to the Anglo-Persian Oil Co., and Mr. S. Ford, an English resident, used their local influence to get the two prisoners released, though, unfortunately, the two days' detention had already ruined their chances in the race.

With regard to the Sahara flight recently undertaken by Mr. and Mrs. R. W. H. Knight, we are indebted to the editor of *Le Manche à Balai*, the Shell Company's North African aeronautical review, for some interesting amendments to the information given in *Flight* of October 18. It was stated in error that Capt. Wauthier was the only pilot to have made this desert crossing from Algiers prior to Mr. Knight's attempt. In actual fact the first civil aviator to have flown this route (*via* In-Guezzam and Tamanrasset) was Mr. Robert Germain, who reached Agades (about 400 miles north of Kano, Mr. Knight's destination) on January 15 of this year. Forty-eight hours afterwards Capt. Wauthier completed the same flight. Finally, at the end of March, Messrs. Hirshauer and Poulin took this route on their way to the Belgian Congo. In addition to these civil flights, a certain number of military aircraft from North Africa have penetrated as far south as In-Guezzam, while others belonging to the squadrons of French Equatorial Africa, have flown north as far as Agades.

From the Shell Company it is learned that Mr. and Mrs. R. W. H Knight reached their destination, Kano, Nigeria, on Wednesday, October 24 after a flight lasting two weeks and two days.

To those whose offices are not directly situated on the tarmac, the accustomed sound of aero engines is as soothing as bluebottles in a schoolroom. Nevertheless, out of consideration for those telephoning within a fifty yards' radius, engines are now bench-tested at dead of night. To the B.B.C., however, aeroplanes are just one more of the "noises off" which must be potted against the time when they may come in handy. Some days ago the Airwork chief instructor contracted a crick in the neck flying in tight circles round the microphone in preparation for the wireless play "Delayed Drop." Now the B.B.C. are down at Heston again making records for use in their MacRobertson Race commemoration programme on Wednesday.

The entrance of aviation into the field of daily transport has led to a misunderstanding which is a sign of the times. On October 19 a pupil rang up the Heston traffic office asking for a taxi to meet him at Rochford Aerodrome, Southend. Both motor cars and aeroplanes are booked from the same counter, and a puzzled official, answering the telephone, enquired if he really meant a *taxi*. Answered in the affirmative, he despatched a fast car from a local hire service. Some time later the pupil rang up again enquiring about the non-arrival of the *aeroplane*.

Flying accidents can be counted in the newspapers and the repair shops, and the lay reader or visitor gets an exaggerated idea of their number. But to-day, in the main Heston workshop, out of eleven aeroplanes, only two are "crashes," neither of which, incidentally, resulted in personal injury to the occupants.

It was incorrectly stated last week that two "Gipsy Gulls" were to be delivered to Indian Transcontinental Airways. The company awaiting delivery is actually Indian National Airways, with whom Airwork, Ltd., is associated.

On October 21 Mr. H. Tyndale-Biscoe, an instructor of the Madras Flying Club, left Heston for Madras in an Avro "Commodore." He is delivering this aeroplane to the Rajah of Vizianagram, who recently learned to fly at the Madras Club. The machine, which is equipped with a complete set of blind flying instruments, is arranged so that half of the back seat can be adapted as a bed if necessary. Mr. Tyndale-Biscoe is about to join the flying staff of Messrs. Tata, in India.

An Apposite Lecture

After all the hullaballoo in the papers apropos airline speeds, it will be interesting to hear what M. Louis Breguet has to say when he lectures next Thursday before the Royal Aeronautical Society on "Speeds of Commercial Aircraft." He will go into all the questions that are so easily overlooked by the casual observer, and will analyse the effects of speed on cost, overhead and administrative charges and depreciation. Stratosphere flying, too, will be considered by M. Breguet.

The lecture, which will be illustrated, will be delivered at 6.30 p.m. in the lecture hall of the Royal Society of Arts.

Air Post Stamps

Owing to extra pressure on our space this week our monthly instalment of "Air Post Stamps," by Douglas B. Armstrong, has been held over until next week.

Boulton and Paul Aircraft, Ltd.

On Wednesday the subscription list opened for an issue at par of 1,000,000 shares of 5s. each for Boulton and Paul Aircraft, Ltd., which company has been formed to acquire the business of aircraft designers and constructors now carried on by Boulton and Paul, Ltd., Norwich, and one-third of the issued share capital of the A.T.S. Company. In addition, the Company will acquire the patent rights and processes held or controlled by Boulton and Paul, Ltd., including those relating to the Townend Ring. Uncompleted orders in hand at June 30 last represent approximately £188,000, and include a large order from the Air Ministry. Orders are also in hand for Imperial Airways. The Chairman of the Company will be Lord Gorell, and the other directors will include Viscount Sandon, Mr. J. D. North, and Mr. S. W. Hiscocks.

NEW COMPANIES

AIR LIMOUSINES, LIMITED, 127, Fenchurch Street, E.C.3. Nominal capital £1,000 in 5s. shares. Objects, to adopt an agreement with R. G. Doig, and to carry on the business of aeroplane mfrs. and dealers, to open and own airports, etc. The directors are :—Ronald V. Rhodes, "Charmaine," North Cray Road, North Cray, Kent, public accountant. Robert G. Doig, The Cottage, Birchwood Avenue, Sidcup, aero engineer.

DISTRIBUTORS OF WORLDWIN PISTONS, LTD., 61, Regent House, 253, Regent Street, W.1. Capital £100 in £1 shares. Objects: to carry on the business of sellers and distributors of pistons manufactured by Worldwin Pistons, Ltd., for internal-combustion and/or other engines. The subscribers (each with one share) are :— Edward Edwards, 235, Regent St., W.1. solicitor's clerk. Enid Mongredien, 20, Queen's Avenue, Muswell Hill, N.10, clerk. The first directors are not named. Solicitors: John B. Borer, 235, Regent Street, W.1.

PUBLICATIONS RECEIVED

Aeronautical Research Committee Reports and Memoranda. No. 1610. Abstract. Analysis of Experimental Observations in Problems of Elastic Stability. By R. V. Southwell. December, 1931. Price 2d. net. London: H.M. Stationery Office.

National Advisory Committee for Aeronautics. Report No. 477. Effect of Viscosity on Fuel Leakage Between Lapped Plungers and Sleeves and on the Discharge from a Pump-Injection System. By A. M. Rothrock and E. T. Marsh. Price 10 cents. No. 478. Experimental Verification of the Theory of Wind-Tunnel Boundary Interference. By Theodore Theodorsen and Abe Silverstein. Price 10 cents. No. 481. Working Charts for the Determination of Propeller Thrust at Various Air Speeds. By Edwin P. Hartman. Price 10 cents. No. 482. Wing-Fuselage Interference, Tail Buffetting, and Air Flow about the Tail of a Low-Wing Monoplane By James A. White and Manley J. Hood. Price 10 cents. No. 484. A Flight Investigation of the Effect of Mass Distribution and Control Setting on the Spinning of the XN2Y-1 Airplane. By N. F. Scudder. Price 5 cents. No. 486. Infra-red Radiation from Explosions in a Spark-Ignition Engine. By Charles F. Marvin, Jr., Frank R. Caldwell and Sydney Steele. Price 10 cents. United States: Superintendent of Documents, Washington, D.C.

The Autogiro and How to Fly It. (Second Edition.) By Reginald Brie. Price 5/- net. London: Sir Isaac Pitman & Sons, Ltd.

Denmark, 1934. Published by the Royal Danish Ministry for Foreign Affairs and the Danish Statistical Department, 29, Pont Street, S.W.1.

Airships in Peace and War. By Captain J. A. Sinclair. Price 18/- net. London: Rich & Cowan, Ltd.

AERONAUTICAL PATENT SPECIFICATIONS

Abbreviations: Cyl. = cylinder; i.c. = internal combustion; m. = motors. (The numbers in brackets are those under which the Specification will be printed and abridged, etc.)

APPLIED FOR IN 1933
Published November 1st, 1934.

3237. NAAMLOOZE VENNOOTSCHAP INSTITUUT VOOR AERO- AND HYDRODYNAMIEK. Aircraft. (417,504).
9123. CHANCE BROS. & CO., LTD., and SLIM, T. H. Flashing apparatus for navigational and other lights. (417,261).
10456. BRISTOL AEROPLANE CO., LTD., FEDDEN, A. H. R., and MAYER, F. Liquid coolers for aircraft or other vehicles. (417,334).
19612. BLACKBURN AEROPLANE & MOTOR CO., LTD., and RENNIE, J. D. Fuel-jettisoning valve arrangement for aircraft.
32127. FAIREY AVIATION CO., LTD., and BROWN, A. C. Control surfaces of aircraft. (417,487).
19118. PEIRCE, H. C., & DESOUTTER, A. M. Navigation lamps for aircraft. (417,319).
27152. NAAMLOOZE VENNOOTSCHAP INSTITUUT VOOR AERO- & HYDRODYNAMIEK. Aircraft. (417,581).